PUNA GEOTHERMAL VENTURE

A Hawaii Partnership

August 2, 1993

John C. Lewin, M.D., Director
State Department of Health
P.O. Box 3378
Honolulu, HI 96801

SUBJ: KS-10 CLEANOUT PM-10 MONITORING REPORT

Dear Dr. Lewin,

Attached please find the required PM-10 analysis for ambient air samples taken in conjunction with well cleanout operations at Well KS-10 on June 17 and June 18 of this year.

Should you or your staff have any questions, please contact me.

Sincerely,

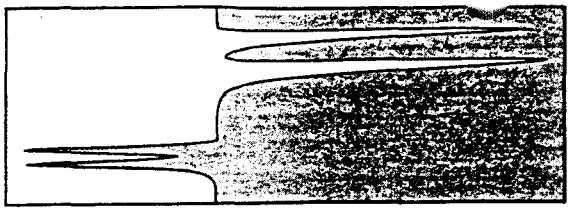
Thomas G. Kizis

Thomas G. Kizis
Environmental Manager

c: S. Morris
D. Berube
N. Hirai (DOH)
G. Davidson
Mesquite

File: KS-10

14-3860 Kapoho Pahoa Road, Pahoa, Hawaii 96778 • (808) 961-2786 • Facsimile (808) 935-5562
Post Office Box 30, Pahoa, Hawaii 96778



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

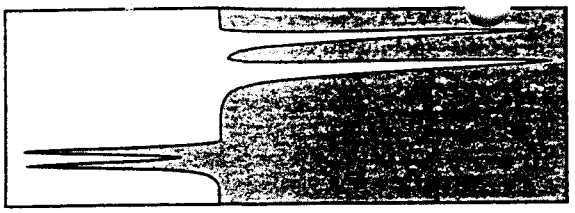
PM10 Monitor Location *Southwest #1*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	6/17/93	10:55	6/18/93	08:45
Elapsed Time, Hrs.	17.63		**Lab Number**	4957-1
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	1198		**Filter Number**	TCI # 38

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 3.34E-03	< 1.93E+02
LEAD	1.15E+00	9.60E-04	5.56E+01
IRON	1.66E+01	1.39E-02	8.02E+02
MANGANESE	6.20E-01	5.17E-04	3.00E+01
ZINC	8.40E+00	7.01E-03	4.06E+02
BARIUM	< 8.00E+00	< 6.68E-03	< 3.86E+02
CADMIUM	< 2.00E-01	< 1.67E-04	< 9.66E+00
COPPER	2.36E+01	1.97E-02	1.14E+03
CHROMIUM	1.41E+00	1.18E-03	6.81E+01
NICKEL	< 4.00E+00	< 3.34E-03	< 1.93E+02
SELENIUM	< 8.00E+00	< 6.68E-03	< 3.86E+02
VANADIUM	< 4.00E+00	< 3.34E-03	< 1.93E+02
SODIUM	3.18E+03	2.65E+00	1.54E+05
POTASSIUM	1.68E+02	1.40E-01	8.12E+03
CHLORIDE	4.52E+03	3.77E+00	2.18E+05
FLUORIDE	< 2.00E+01	< 1.67E-02	< 9.66E+02
SULFATE	1.46E+03	1.22E+00	7.05E+04
Total PM10	2.07E+04	1.73E+01	

PGV Site Operations: KS-10 Flow test

Power Fail Interruptions: Elapsed time accounts for timed stop from 19:40 to 00:00



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

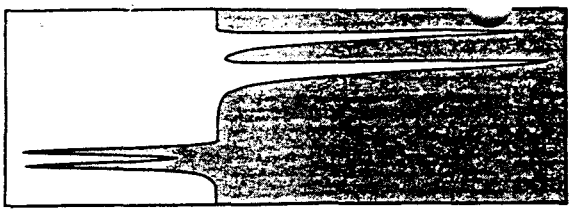
PM10 Monitor Location *Southwest #2*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	6/17/93	10:57	6/18/93	08:45
Elapsed Time, Hrs.	17.59		**Lab Number**	4957-2
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	1196		**Filter Number**	TCI # 40

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 3.35E-03	< 1.97E+02
LEAD	< 8.00E-01	< 6.69E-04	< 3.94E+01
IRON	2.05E+01	1.71E-02	1.01E+03
MANGANESE	5.70E-01	4.77E-04	2.81E+01
ZINC	< 8.00E+00	< 6.69E-03	< 3.94E+02
BARIUM	< 8.00E+00	< 6.69E-03	< 3.94E+02
CADMIUM	< 2.00E-01	< 1.67E-04	< 9.85E+00
COPPER	2.56E+01	2.14E-02	1.26E+03
CHROMIUM	1.22E+00	1.02E-03	6.01E+01
NICKEL	< 4.00E+00	< 3.35E-03	< 1.97E+02
SELENIUM	< 8.00E+00	< 6.69E-03	< 3.94E+02
VANADIUM	< 4.00E+00	< 3.35E-03	< 1.97E+02
SODIUM	3.42E+03	2.86E+00	1.68E+05
POTASSIUM	1.74E+02	1.46E-01	8.57E+03
CHLORIDE	4.33E+03	3.62E+00	2.13E+05
FLUORIDE	< 2.00E+01	< 1.67E-02	< 9.85E+02
SULFATE	1.41E+03	1.18E+00	6.95E+04
Total PM10	2.03E+04	1.70E+01	

PGV Site Operations: KS-10 Flow test

Power Fail Interruptions: Elapsed time accounts for timed stop from 19:40 to 00:00



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

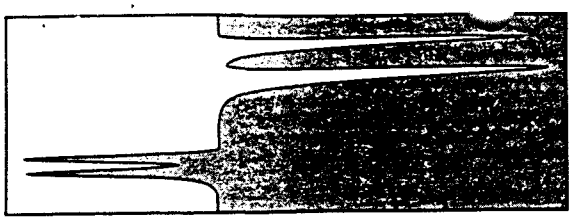
PM10 Monitor Location *Southwest #1*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	6/18/93	09:02	6/19/93	09:06
Elapsed Time, Hrs.	17.07		**Lab Number**	4957-3
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	1161		**Filter Number**	TCI # 68

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 3.45E-03	< 2.96E+02
LEAD	8.60E-01	7.41E-04	6.37E+01
IRON	2.22E+01	1.91E-02	1.64E+03
MANGANESE	1.06E+00	9.13E-04	7.85E+01
ZINC	< 8.00E+00	< 6.89E-03	< 5.93E+02
BARIUM	< 8.00E+00	< 6.89E-03	< 5.93E+02
CADMIUM	< 2.00E-01	< 1.72E-04	< 1.48E+01
COPPER	3.39E+01	2.92E-02	2.51E+03
CHROMIUM	1.25E+00	1.08E-03	9.26E+01
NICKEL	< 4.00E+00	< 3.45E-03	< 2.96E+02
SELENIUM	< 8.00E+00	< 6.89E-03	< 5.93E+02
VANADIUM	< 4.00E+00	< 3.45E-03	< 2.96E+02
SODIUM	2.12E+03	1.83E+00	1.57E+05
POTASSIUM	1.55E+02	1.34E-01	1.15E+04
CHLORIDE	3.06E+03	2.64E+00	2.27E+05
FLUORIDE	< 2.00E+01	< 1.72E-02	< 1.48E+03
SULFATE	1.33E+03	1.15E+00	9.85E+04
Total PM10	1.35E+04	1.16E+01	

PGV Site Operations: No Venting

Power Fail Interruptions: Elapsed time accounts for timed stop from 17:24 to 00:00



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

PM10 Monitor Location *Southwest #2*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	6/18/93	09:02	6/19/93	09:06
Elapsed Time, Hrs.	17.00		**Lab Number**	4957-4
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	1156		**Filter Number**	TCI # 71

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 3.46E-03	< 2.34E+02
LEAD	8.00E-01	6.92E-04	4.68E+01
IRON	1.73E+01	1.50E-02	1.01E+03
MANGANESE	8.20E-01	7.10E-04	4.80E+01
ZINC	< 8.00E+00	< 6.92E-03	< 4.68E+02
BARIUM	< 8.00E+00	< 6.92E-03	< 4.68E+02
CADMIUM	< 2.00E-01	< 1.73E-04	< 1.17E+01
COPPER	2.24E+01	1.94E-02	1.31E+03
CHROMIUM	1.20E+00	1.04E-03	7.02E+01
NICKEL	< 4.00E+00	< 3.46E-03	< 2.34E+02
SELENIUM	< 8.00E+00	< 6.92E-03	< 4.68E+02
VANADIUM	< 4.00E+00	< 3.46E-03	< 2.34E+02
SODIUM	2.14E+03	1.85E+00	1.25E+05
POTASSIUM	1.50E+02	1.30E-01	8.77E+03
CHLORIDE	2.83E+03	2.45E+00	1.65E+05
FLUORIDE	< 2.00E+01	< 1.73E-02	< 1.17E+03
SULFATE	1.28E+03	1.11E+00	7.49E+04
Total PM10	1.71E+04	1.48E+01	

PGV Site Operations: No Venting

Power Fail Interruptions: Elapsed time accounts for timed stop from 17:24 to 00:00

PUNA GEOTHERMAL VENTURE
A Hawaii Partnership

August 2, 1993

John C. Lewin, M.D., Director
State Department of Health
P.O. Box 3378
Honolulu, HI 96801

SUBJ: KS-10 STEAM SAMPLE ANALYSES

Dear Dr. Lewin,

Attached please find required analyses for steam samples taken in conjunction with well cleanout operations at Well KS-10 on June 17 of this year.

Should you or your staff have any questions, please contact me.

Sincerely,

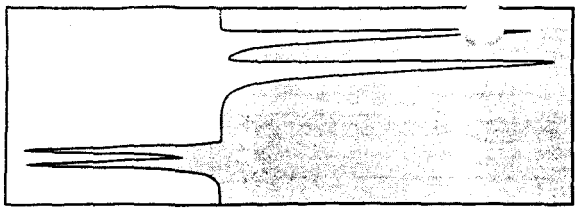
Thomas G. Kizis

Thomas G. Kizis
Environmental Manager

c: S. Morris
D. Berube
N. Hirai (DOH)
G. Davidson
Mesquite

File: KS-10

14-3860 Kapoho Pahoa Road, Pahoa, Hawaii 96778 • (808) 961-2786 • Facsimile (808) 935-5562
Post Office Box 30, Pahoa, Hawaii 96778



THERMOCHEM

PGV Steam Venting Emissions
Source Test Summary

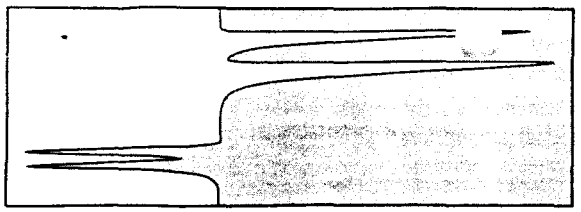
Emission Source Location: KS-10 Muffler
Field Operations: KS-10 clean-out

Test Date: 6/17/93
Test Time: 16:53-18:19

Lab Series Number: 4955(1-3)
Sample Train: Metals
Nozzle Size: 1/2 inch
Total Sample Weight: 535.0 g
Average Sample Rate: 6.22 g/min

Stack Diameter: 15 ft.
Average Stack Temperature: 186 Deg. F
Average Mass Flow: 145 KPH Steam
Average Volumetric Flow: 64767 ACFM
Average Stack Velocity: 367 Ft/min

Analyte	Total ug	Concentration ug/Kg	Concentration ug/m3	Emission Rate g/hr	Emission Rate lbs/hr
Arsenic	< 4.4	< 8.3	< 4.9	< 0.54	< 0.0012
Lead	5.69	10.6	6.29	0.700	0.00154
Iron	357	667	394	43.9	0.0968
Manganese	2.95	5.51	3.26	0.363	0.000800
Zinc	18.1	33.8	20.0	2.23	0.00491
Barium	35.6	66.5	39.3	4.38	0.00965
Cadmium	35.3	66.0	39.0	4.34	0.00957
Copper	3.0	5.6	3.3	0.37	0.00081
Chromium	1.36	2.54	1.50	0.167	0.000369
Nickel	< 4.4	< 8.3	< 4.9	< 0.54	< 0.0012
Selenium	< 4.4	< 8.2	< 4.9	< 0.54	< 0.0012
Vanadium	< 4.4	< 8.3	< 4.9	< 0.54	< 0.0012
Beryllium	< 2.2	< 4.1	< 2.4	< 0.27	< 0.00060



THERMOCHEM

PGV Steam Venting Emissions
Source Test Summary

Emission Source Location: KS-10 Muffler
Field Operations: KS-10 Well clean-out

Test Date: 6/17/93
Test Time: 16:57-18:00

Lab Series Number: 4963(1-3)
Sample Train: Anions, sodium
Nozzle Size: 5/8 inch
Total Sample Weight: 425 g
Average Sample Rate: 6.75 g/min

Stack Diameter: 15 ft
Average Stack Temperature: 186 Deg. F
Average Mass Flow: 148 KPH Steam
Average Volumetric Flow: 66107 ACFM
Average Stack Velocity: 374 Ft/min

Analyte	Total ug	Concentration ug/Kg	Concentration ug/m3	Emission Rate g/hr	Emission Rate lbs/hr
Sodium	27000	63500	37500	4270	9.40
Boron	< 160	< 380	< 220	< 26	< 0.056
Chloride	128	301	178	20.2	0.0446
Fluoride	< 20	< 47	< 28	< 3.2	< 0.0070

THERMOCHEM

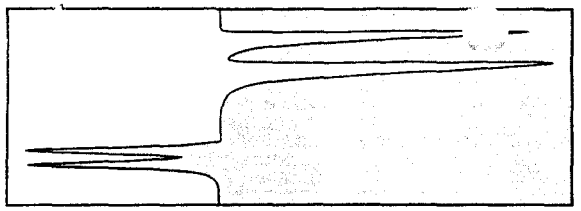
PGV Steam Venting Emissions
Source Test Summary

Emission Source Location: KS-10 Muffler
Field Operations: KS-10 Well clean-out
Test Date: 6/17/93
Test Time: 18:10-18:54

Lab Series Number: 4952(1-3)
Sample Train: Mercury
Nozzle Size: 5/8 inch
Total Sample Weight: 295 g
Average Sample Rate: 6.70 g/min

Stack Diameter: 15 ft.
Average Stack Temperature: 186 Deg. F
Average Mass Flow: 190 KPH Steam
Average Volumetric Flow: 84867 ACFM
Average Stack Velocity: 480 Ft/min

Analyte	Total ug	Concentration ug/Kg	Concentration ug/m3	Emission Rate g/hr	Emission Rate lbs/hr
Mercury	< 0.56	< 1.9	< 1.1	< 0.16	< 0.00036



THERMOCHEM

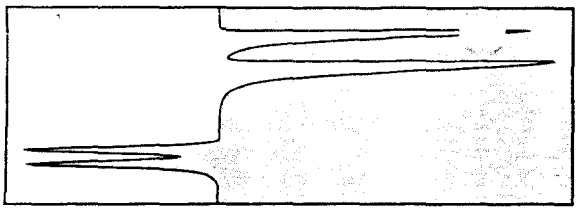
PGV Steam Venting Emissions
Source Test Summary

Emission Source Location:	KS-10 Muffler	**Test Date:**	6/17/93
Field Operations:	KS-10 clean-out	**Test Time:**	16:53-18:19

Lab Series Number:	4955(1-3)
Sample Train:	Metals
Nozzle Size:	1/2 inch
Total Sample Weight:	535.0 g
Average Sample Rate:	6.22 g/min

Stack Diameter:	15 ft.
Average Stack Temperature:	186 Deg. F
Average Mass Flow:	145 KPH Steam
Average Volumetric Flow:	64767 ACFM
Average Stack Velocity:	367 Ft/min

Analyte	Total ug	Concentration ug/Kg	Concentration ug/m3	Emission Rate g/hr	Emission Rate lbs/hr
Arsenic	< 4.4	< 8.3	< 4.9	< 0.54	< 0.0012
Lead	5.69	10.6	6.29	0.700	0.00154
Iron	357	667	394	43.9	0.0968
Manganese	2.95	5.51	3.26	0.363	0.000800
Zinc	18.1	33.8	20.0	2.23	0.00491
Barium	35.6	66.5	39.3	4.38	0.00965
Cadmium	35.3	66.0	39.0	4.34	0.00957
Copper	3.0	5.6	3.3	0.37	0.00081
Chromium	1.36	2.54	1.50	0.167	0.000369
Nickel	< 4.4	< 8.3	< 4.9	< 0.54	< 0.0012
Selenium	< 4.4	< 8.2	< 4.9	< 0.54	< 0.0012
Vanadium	< 4.4	< 8.3	< 4.9	< 0.54	< 0.0012
Beryllium	< 2.2	< 4.1	< 2.4	< 0.27	< 0.00060



THERMOCHEM

PGV Steam Venting Emissions
Source Test Summary

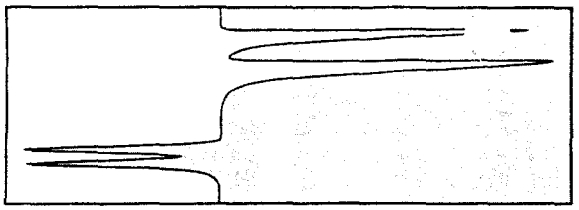
Emission Source Location: KS-10 Muffler
Field Operations: KS-10 Well clean-out

Test Date: 6/17/93
Test Time: 16:57-18:00

Lab Series Number: 4963(1-3)
Sample Train: Anions, sodium
Nozzle Size: 5/8 inch
Total Sample Weight: 425 g
Average Sample Rate: 6.75 g/min

Stack Diameter: 15 ft
Average Stack Temperature: 186 Deg. F
Average Mass Flow: 148 KPH Steam
Average Volumetric Flow: 66107 ACFM
Average Stack Velocity: 374 Ft/min

Analyte	Total ug	Concentration ug/Kg	Concentration ug/m3	Emission Rate g/hr	Emission Rate lbs/hr
Sodium	27000	63500	37500	4270	9.40
Boron	< 160	< 380	< 220	< 26	< 0.056
Chloride	128	301	178	20.2	0.0446
Fluoride	< 20	< 47	< 28	< 3.2	< 0.0070



THERMOCHEM

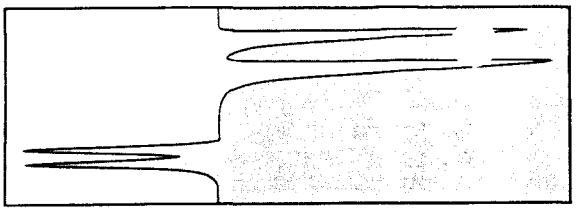
PGV Steam Venting Emissions
Source Test Summary

Emission Source Location: KS-10 Muffler
Field Operations: KS-10 Well clean-out
Test Date: 6/17/93
Test Time: 18:10-18:54

Lab Series Number: 4952(1-3)
Sample Train: Mercury
Nozzle Size: 5/8 inch
Total Sample Weight: 295 g
Average Sample Rate: 6.70 g/min

Stack Diameter: 15 ft.
Average Stack Temperature: 186 Deg. F
Average Mass Flow: 190 KPH Steam
Average Volumetric Flow: 84867 ACFM
Average Stack Velocity: 480 Ft/min

Analyte	Total ug	Concentration ug/Kg	Concentration ug/m3	Emission Rate g/hr	Emission Rate lbs/hr
Mercury	< 0.56	< 1.9	< 1.1	< 0.16	< 0.00036



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

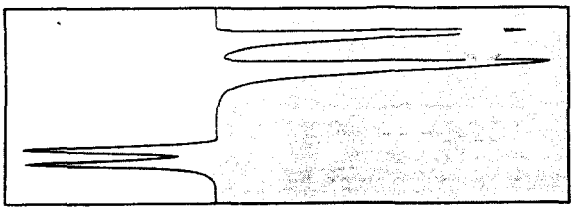
PM10 Monitor Location *Southwest #1*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	6/17/93	10:55	6/18/93	08:45
Elapsed Time, Hrs.	17.63		**Lab Number**	4957-1
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	1198		**Filter Number**	TCI # 38

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 3.34E-03	< 1.93E+02
LEAD	1.15E+00	9.60E-04	5.56E+01
IRON	1.66E+01	1.39E-02	8.02E+02
MANGANESE	6.20E-01	5.17E-04	3.00E+01
ZINC	8.40E+00	7.01E-03	4.06E+02
BARIUM	< 8.00E+00	< 6.68E-03	< 3.86E+02
CADMIUM	< 2.00E-01	< 1.67E-04	< 9.66E+00
COPPER	2.36E+01	1.97E-02	1.14E+03
CHROMIUM	1.41E+00	1.18E-03	6.81E+01
NICKEL	< 4.00E+00	< 3.34E-03	< 1.93E+02
SELENIUM	< 8.00E+00	< 6.68E-03	< 3.86E+02
VANADIUM	< 4.00E+00	< 3.34E-03	< 1.93E+02
SODIUM	3.18E+03	2.65E+00	1.54E+05
POTASSIUM	1.68E+02	1.40E-01	8.12E+03
CHLORIDE	4.52E+03	3.77E+00	2.18E+05
FLUORIDE	< 2.00E+01	< 1.67E-02	< 9.66E+02
SULFATE	1.46E+03	1.22E+00	7.05E+04
Total PM10	2.07E+04	1.73E+01	

PGV Site Operations: KS-10 Flow test

Power Fail Interruptions: Elapsed time accounts for timed stop from 19:40 to 00:00



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

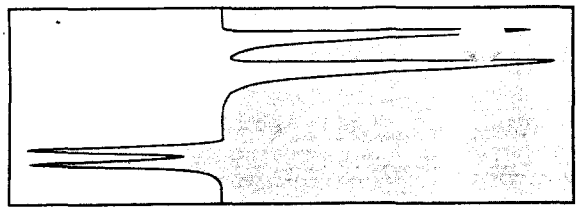
PM10 Monitor Location *Southwest #2*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	6/17/93	10:57	6/18/93	08:45
Elapsed Time, Hrs.	17.59		**Lab Number**	4957-2
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	1196		**Filter Number**	TCI # 40

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 3.35E-03	< 1.97E+02
LEAD	< 8.00E-01	< 6.69E-04	< 3.94E+01
IRON	2.05E+01	1.71E-02	1.01E+03
MANGANESE	5.70E-01	4.77E-04	2.81E+01
ZINC	< 8.00E+00	< 6.69E-03	< 3.94E+02
BARIUM	< 8.00E+00	< 6.69E-03	< 3.94E+02
CADMIUM	< 2.00E-01	< 1.67E-04	< 9.85E+00
COPPER	2.56E+01	2.14E-02	1.26E+03
CHROMIUM	1.22E+00	1.02E-03	6.01E+01
NICKEL	< 4.00E+00	< 3.35E-03	< 1.97E+02
SELENIUM	< 8.00E+00	< 6.69E-03	< 3.94E+02
VANADIUM	< 4.00E+00	< 3.35E-03	< 1.97E+02
SODIUM	3.42E+03	2.86E+00	1.68E+05
POTASSIUM	1.74E+02	1.46E-01	8.57E+03
CHLORIDE	4.33E+03	3.62E+00	2.13E+05
FLUORIDE	< 2.00E+01	< 1.67E-02	< 9.85E+02
SULFATE	1.41E+03	1.18E+00	6.95E+04
Total PM10	2.03E+04	1.70E+01	

PGV Site Operations: KS-10 Flow test

Power Fail Interruptions: Elapsed time accounts for timed stop from 19:40 to 00:00



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

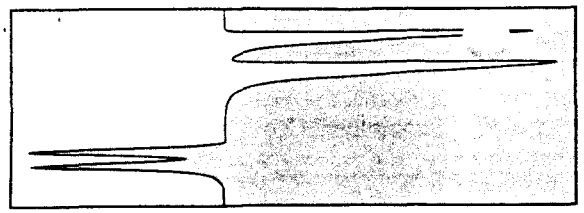
PM10 Monitor Location *Southwest #1*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	6/18/93	09:02	6/19/93	09:06
Elapsed Time, Hrs.	17.07		**Lab Number**	4957-3
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	1161		**Filter Number**	TCI # 68

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 3.45E-03	< 2.96E+02
LEAD	8.60E-01	7.41E-04	6.37E+01
IRON	2.22E+01	1.91E-02	1.64E+03
MANGANESE	1.06E+00	9.13E-04	7.85E+01
ZINC	< 8.00E+00	< 6.89E-03	< 5.93E+02
BARIUM	< 8.00E+00	< 6.89E-03	< 5.93E+02
CADMIUM	< 2.00E-01	< 1.72E-04	< 1.48E+01
COPPER	3.39E+01	2.92E-02	2.51E+03
CHROMIUM	1.25E+00	1.08E-03	9.26E+01
NICKEL	< 4.00E+00	< 3.45E-03	< 2.96E+02
SELENIUM	< 8.00E+00	< 6.89E-03	< 5.93E+02
VANADIUM	< 4.00E+00	< 3.45E-03	< 2.96E+02
SODIUM	2.12E+03	1.83E+00	1.57E+05
POTASSIUM	1.55E+02	1.34E-01	1.15E+04
CHLORIDE	3.06E+03	2.64E+00	2.27E+05
FLUORIDE	< 2.00E+01	< 1.72E-02	< 1.48E+03
SULFATE	1.33E+03	1.15E+00	9.85E+04
Total PM10	1.35E+04	1.16E+01	

PGV Site Operations: No Venting

Power Fail Interruptions: Elapsed time accounts for timed stop from 17:24 to 00:00



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

PM10 Monitor Location *Southwest #2*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	6/18/93	09:02	6/19/93	09:06
Elapsed Time, Hrs.	17.00		**Lab Number**	4957-4
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	1156		**Filter Number**	TCI # 71

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 3.46E-03	< 2.34E+02
LEAD	8.00E-01	6.92E-04	4.68E+01
IRON	1.73E+01	1.50E-02	1.01E+03
MANGANESE	8.20E-01	7.10E-04	4.80E+01
ZINC	< 8.00E+00	< 6.92E-03	< 4.68E+02
BARIUM	< 8.00E+00	< 6.92E-03	< 4.68E+02
CADMIUM	< 2.00E-01	< 1.73E-04	< 1.17E+01
COPPER	2.24E+01	1.94E-02	1.31E+03
CHROMIUM	1.20E+00	1.04E-03	7.02E+01
NICKEL	< 4.00E+00	< 3.46E-03	< 2.34E+02
SELENIUM	< 8.00E+00	< 6.92E-03	< 4.68E+02
VANADIUM	< 4.00E+00	< 3.46E-03	< 2.34E+02
SODIUM	2.14E+03	1.85E+00	1.25E+05
POTASSIUM	1.50E+02	1.30E-01	8.77E+03
CHLORIDE	2.83E+03	2.45E+00	1.65E+05
FLUORIDE	< 2.00E+01	< 1.73E-02	< 1.17E+03
SULFATE	1.28E+03	1.11E+00	7.49E+04
Total PM10	1.71E+04	1.48E+01	

PGV Site Operations: No Venting

Power Fail Interruptions: Elapsed time accounts for timed stop from 17:24 to 00:00

THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

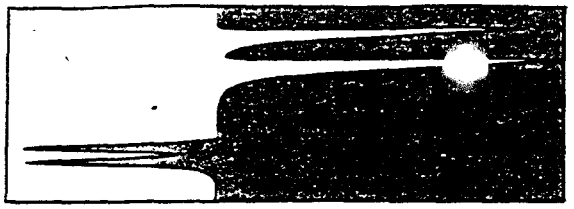
PM10 Monitor Location *Southwest Station #1*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	4/20/93	09:50	4/20/93	15:20
Elapsed Time, Hrs.	5.47		**Lab Number**	4814-1
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	372		**Filter Number**	039

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 1.08E-02	< 5.88E+02
LEAD	< 8.00E-01	< 2.15E-03	< 1.18E+02
IRON	1.91E+01	5.14E-02	2.81E+03
MANGANESE	4.40E-01	1.18E-03	6.47E+01
ZINC	< 8.00E+00	< 2.15E-02	< 1.18E+03
BARIUM	< 8.00E+02	< 2.15E+00	< 1.18E+05
CADMIUM	< 2.00E-01	< 5.38E-04	< 2.94E+01
COPPER	7.41E+00	1.99E-02	1.09E+03
CHROMIUM	< 8.00E-01	< 2.15E-03	< 1.18E+02
NICKEL	< 4.00E+00	< 1.08E-02	< 5.88E+02
SELENIUM	< 4.00E+00	< 1.08E-02	< 5.88E+02
VANADIUM	< 4.00E+00	< 1.08E-02	< 5.88E+02
SODIUM	9.00E+02	2.42E+00	1.32E+05
POTASSIUM	5.92E+01	1.59E-01	8.71E+03
CHLORIDE	8.72E+02	2.35E+00	1.28E+05
FLUORIDE	< 2.00E+01	< 5.38E-02	< 2.94E+03
SULFATE	5.53E+02	1.49E+00	8.13E+04
Total PM10	6.80E+03	1.83E+01	

PGV Site Operations: KS-9 Clean out

Power Fail Interruptions: None



THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

PM10 Monitor Location *Southwest Station #2*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	4/20/93	09:50	4/20/93	15:20
Elapsed Time, Hrs.	5.47		**Lab Number**	4814-2
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	372		**Filter Number**	043

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 1.08E-02	< 9.30E+02
LEAD	< 8.00E-01	< 2.15E-03	< 1.86E+02
IRON	1.60E+01	4.30E-02	3.72E+03
MANGANESE	4.30E-01	1.16E-03	1.00E+02
ZINC	< 8.00E+00	< 2.15E-02	< 1.86E+03
BARIUM	< 8.00E+02	< 2.15E+00	< 1.86E+05
CADMIUM	< 2.00E-01	< 5.38E-04	< 4.65E+01
COPPER	5.39E+00	1.45E-02	1.25E+03
CHROMIUM	1.26E+00	3.39E-03	2.93E+02
NICKEL	< 4.00E+00	< 1.08E-02	< 9.30E+02
SELENIUM	< 4.00E+00	< 1.08E-02	< 9.30E+02
VANADIUM	< 4.00E+00	< 1.08E-02	< 9.30E+02
SODIUM	8.68E+02	2.34E+00	2.02E+05
POTASSIUM	6.32E+01	1.70E-01	1.47E+04
CHLORIDE	8.98E+02	2.42E+00	2.09E+05
FLUORIDE	< 2.00E+01	< 5.38E-02	< 4.65E+03
SULFATE	5.61E+02	1.51E+00	1.30E+05
Total PM10	4.30E+03	1.16E+01	

PGV Site Operations: KS-9 clean out

Power Fail Interruptions: None

THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

PM10 Monitor Location — *Wade Station*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	4/20/93	09:30	4/20/93	15:42
Elapsed Time, Hrs.	6.20		Lab Number	4814-3
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	421		Filter Number	065

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 9.49E-03	< 5.13E+02
LEAD	< 8.00E-01	< 1.90E-03	< 1.03E+02
IRON	1.18E+01	2.80E-02	1.51E+03
MANGANESE	4.20E-01	9.97E-04	5.38E+01
ZINC	< 8.00E+00	< 1.90E-02	< 1.03E+03
BARIUM	< 8.00E+02	< 1.90E+00	< 1.03E+05
CADMIUM	< 2.00E-01	< 4.75E-04	< 2.56E+01
COPPER	5.86E+00	1.39E-02	7.51E+02
CHROMIUM	8.70E-01	2.06E-03	1.12E+02
NICKEL	< 4.00E+00	< 9.49E-03	< 5.13E+02
SELENIUM	< 4.00E+00	< 9.49E-03	< 5.13E+02
VANADIUM	< 4.00E+00	< 9.49E-03	< 5.13E+02
SODIUM	9.32E+02	2.21E+00	1.19E+05
POTASSIUM	7.52E+01	1.78E-01	9.64E+03
CHLORIDE	1.24E+03	2.94E+00	1.59E+05
FLUORIDE	< 2.00E+01	< 4.75E-02	< 2.56E+03
SULFATE	6.05E+02	1.44E+00	7.76E+04
Total PM10	7.80E+03	1.85E+01	

PGV Site Operations: KS-9 clean out

Power Fail Interruptions: None

THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

PM10 Monitor Location *Southwest Station #1*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	4/21/93	10:18	4/21/93	17:06
Elapsed Time, Hrs.	6.78		Lab Number	4814-4
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	461		Filter Number	053

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 8.68E-03	< 5.19E+02
LEAD	< 8.00E-01	< 1.74E-03	< 1.04E+02
IRON	1.21E+01	2.63E-02	1.57E+03
MANGANESE	4.10E-01	8.90E-04	5.32E+01
ZINC	< 8.00E+00	< 1.74E-02	< 1.04E+03
BARIUM	< 8.00E+02	< 1.74E+00	< 1.04E+05
CADMIUM	< 2.00E-01	< 4.34E-04	< 2.60E+01
COPPER	4.83E+00	1.05E-02	6.27E+02
CHROMIUM	1.13E+00	2.45E-03	1.47E+02
NICKEL	< 4.00E+00	< 8.68E-03	< 5.19E+02
SELENIUM	< 4.00E+00	< 8.68E-03	< 5.19E+02
VANADIUM	< 4.00E+00	< 8.68E-03	< 5.19E+02
SODIUM	1.20E+03	2.60E+00	1.56E+05
POTASSIUM	6.80E+01	1.48E-01	8.83E+03
CHLORIDE	1.69E+03	3.67E+00	2.19E+05
FLUORIDE	< 2.00E+01	< 4.34E-02	< 2.60E+03
SULFATE	5.96E+02	1.29E+00	7.74E+04
Total PM10	7.70E+03	1.67E+01	

PGV Site Operations: No venting. Background

Power Fail Interruptions: None

THERMOCHEM

AMBIENT AIR MONITORING REPORT
PGV PM10 ANALYSIS

PM10 Monitor Location *Southwest Station #2*

	Start Date	Start Time	Stop Date	Stop Time
Sampling Interval	4/21/93	10:18	4/21/93	17:06
Elapsed Time, Hrs.	6.78		**Lab Number**	4814-5
Total Air Volume, m3 (760 mm Hg, 25 Deg. C)	461		**Filter Number**	074

Analyte	Total ug	ug/m3	ug/g PM10
ARSENIC	< 4.00E+00	< 8.68E-03	< 5.00E+02
LEAD	< 8.00E-01	< 1.74E-03	< 1.00E+02
IRON	1.04E+01	2.26E-02	1.30E+03
MANGANESE	< 4.00E-01	< 8.68E-04	< 5.00E+01
ZINC	< 8.00E+00	< 1.74E-02	< 1.00E+03
BARIUM	< 8.00E+02	< 1.74E+00	< 1.00E+05
CADMIUM	< 2.00E-01	< 4.34E-04	< 2.50E+01
COPPER	1.07E+01	2.33E-02	1.34E+03
CHROMIUM	8.20E-01	1.78E-03	1.03E+02
NICKEL	< 4.00E+00	< 8.68E-03	< 5.00E+02
SELENIUM	< 4.00E+00	< 8.68E-03	< 5.00E+02
VANADIUM	< 4.00E+00	< 8.68E-03	< 5.00E+02
SODIUM	1.10E+03	2.39E+00	1.38E+05
POTASSIUM	7.28E+01	1.58E-01	9.10E+03
CHLORIDE	1.68E+03	3.65E+00	2.10E+05
FLUORIDE	< 2.00E+01	< 4.34E-02	< 2.50E+03
SULFATE	6.01E+02	1.30E+00	7.51E+04
Total PM10	8.00E+03	1.74E+01	

PGV Site Operations: No venting. Background

Power Fail Interruptions: None

WL. -

PUNA GEOTHERMAL VENTURE

A Hawaii Partnership

January 25, 1994

Keith Ahue, Chairperson
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

SUBJ: KS-9 AND KS-10 SAMPLE ANALYSES

Dear Mr. Ahue,

Attached please find our cleanout sample analyses for Puna Geothermal Venture (PGV) wells KS-9 and KS-10 as requested in your letter to us of January 19, 1994. We apologize for the delay and will do our best to submit future results to you in a more timely manner.

Should you or your staff have any questions, please contact me.

Sincerely,

Thomas G. Kizis

Thomas G. Kizis
Environmental Manager

c: S. Morris
D. Berube

File: KS-9/KS-10

14-3860 Kapoho Pahoa Road, Pahoa, Hawaii 96778 • (808) 961-2786 • Facsimile (808) 935-5562
Post Office Box 30, Pahoa, Hawaii 96778

KW

PUNA GEOTHERMAL VENTURE

A Hawaii Partnership

February 9, 1994

RECEIVED
94 FEB 14 A10:38
DIV. OF WATER & LAND DEVELOPMENT

Keith W. Ahue, Chairperson
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

SUBJ: REQUESTED INFORMATION

Dear Mr. Ahue,

Attached please find the brine and chemistry data you requested in your letter to us of January 31, 1994.

Should you have any questions concerning this data please me.

Sincerely,

Thomas G. Kizis

Thomas G. Kizis
Environmental Manager

c: S. Morris
D. Berube
G. Davidson

File: KS-10

14-3860 Kapoho Pahoa Road, Pahoa, Hawaii 96778 • (808) 961-2786 • Facsimile (808) 935-5562
Post Office Box 30, Pahoa, Hawaii 96778

Sampled 12-29-93

5371 (1-2) January 7, 1994

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number	Descriptor	Silica ppm$_w$
5371-1	PGV KS-10 Produced Brine 12-29-93 10:45	(1310) - In Error 2-10-94
5371-2	PGV KS-9 Produced Water 12-29-93 10:55	219

THERMOCHEM

5371 (1-2) January 12, 1994

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5371–2

Descriptor: PGV KS-9 Produced Water 12-29-93 10:55

Analyte	mg/kg
Sodium	0.89
Chloride	1.60
Sulfate	2.66
Silica	219
Calcium	1.68
Potassium	0.15
Total Dissolved Solids	225

SAMPLED 12-09-93

THERMOCHEM

5322 (1-2) December 28, 1993

Quality Control Data

Samples Received: December 10, 1993

Requested by: Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Analyte	Precision (% RSD)	External Standard (% Recovery)	Sample Spike (% Recovery)
Carbon Dioxide	2.8	102	99
Hydrogen Sulfide	0.06	100	97
Ammonia	N/A	99	96
Nitrogen	0.16	102	N/A
Methane	10	95	N/A
Hydrogen	1.9	101	N/A
Radon	0.96	N/A	N/A

Precision: Percent Relative Standard Deviation of replicate sample analyses.

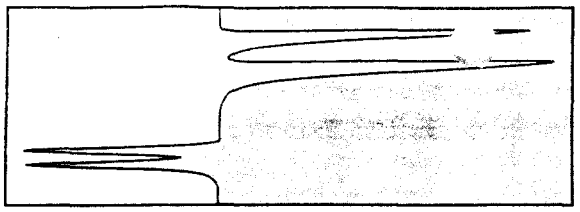
External Standard: Percent Recovery of an independent audit standard analyzed against calibration standards (measured/known x 100).

Sample Spike: Percent Recovery of a known quantity of standard added to sample (measured/theoretical x 100).

N/A: Not applicable.

Paul N. Hirtz
Director of Operations

Distribution: Greg Davidson
Tom Kizis



THERMOCHEM

5322 (1-2) December 28, 1993

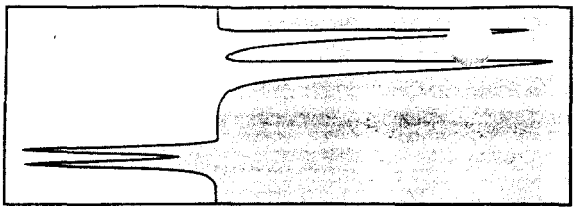
Descriptor: PGV STEAM HEADER 12-09-1993 03:59

Lab Number: 5322-01

Sample Gas/Steam Ratio (ft^3/lb):	0.0164
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	822
Sample Gas/Steam Ratio (ppm by weight):	1650
Percent Air in Sample:	0.059
STP Mls Air in Sample:	0.436
Total Weight of Condensate (grams):	728
Initial Headspace Pressure (psi):	14.30

Gas	Dry Gas % by Volume	Moles per 10^6 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.98 E +05
Carbon Dioxide	4.21 E +01	3.46 E +02	8.43 E +02
Hydrogen Sulfide	5.11 E +01	4.20 E +02	7.93 E +02
Ammonia	<7.96 E -02	<6.55 E -01	<6.18 E -01
Argon	1.50 E -02	1.23 E -01	2.73 E -01
Nitrogen	9.13 E -01	7.50 E +00	1.16 E +01
Methane	1.54 E -02	1.27 E -01	1.12 E -01
Hydrogen	5.85 E +00	4.81 E +01	5.39 E +00

Radon (Pico Curies/Liter Dry Gas, STP):	1902
Radon (Pico Curies/Kg Steam):	1942



THERMOCHEM

5322 (1-2) December 28, 1993

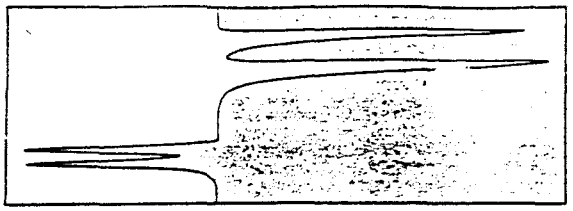
Descriptor: PGV N.C. GAS TO INJECTION 12-09-1993 06:29

Lab Number: 5322-02

Total Weight of Condensate (grams):	<5.70
Initial Headspace Pressure (psi):	9.48

Gas	Dry Gas % by Volume
Carbon Dioxide	5.04 E +01
Hydrogen Sulfide	3.12 E +01
Ammonia	<9.95 E -03
Argon	6.75 E -02
Oxygen	1.76 E -01
Nitrogen	3.08 E +00
Methane	2.85 E -02
Hydrogen	1.50 E +01

Radon (Pico Curies/Liter Dry Gas, STP): 3027



THERMOCHEM

5323 (1) December 29, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5323–1

Descriptor: PGV Monthly Type I Injectate 12-09-93 03:30

Analyte	mg/kg
Sodium	970
Potassium	224
Calcium	21.6
Magnesium	0.41
Lithium	0.45
Silica	206
Boron	2.44
Barium	0.92
Arsenic	0.048
Mercury	<0.00033
Lead	<0.0012
Iron	0.51
Manganese	0.094
Nickel	<0.0061
Copper	<0.0024
Chromium	0.039
Silver	<0.0061
Vanadium	<0.0061
Zinc	<0.12

Analyte	mg/kg
Chloride	1820
Fluoride	<1.3
Sulfate	8.16
Thiosulfate	<2
Nitrate	<1.0
Bromide	6.04
Total Alkalinity, as HCO_3^-	<2.0
Total Inorganic Carbon, as HCO_3^-	247
pH, units	4.43
Ammonia	<0.5
Hydrogen Sulfide	530
Oil and Grease	<5
Total Dissolved Solids	3300
Total Suspended Solids	3.0
Conductivity, umhos/cm	5600
Density, g/ml	0.998

THERMOCHEM

5324 (1-5) December 30, 1993

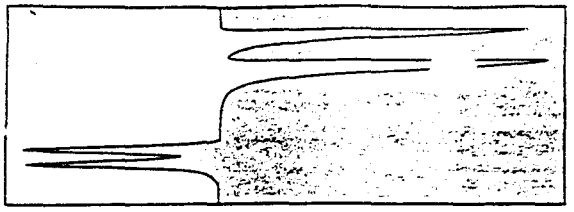
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5324–1

Descriptor: PVG Steam Header 12-09-93 03:53

Analyte	mg/kg
Iron	0.35
Manganese	0.0124
Sodium	0.066
Chloride	0.128
Silica	0.172



THERMOCHEM

5324 (1-5) December 30, 1993

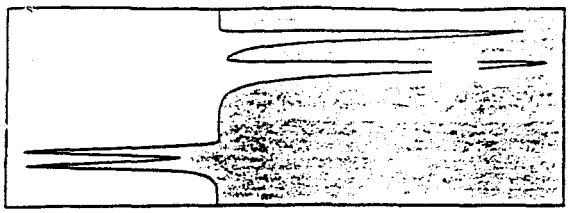
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5324–2

Descriptor: PGV Produced Water KS-9 12-09-93 04:10

Analyte	mg/kg
Iron	0.36
Manganese	0.0415
Sodium	0.74
Chloride	1.59
Calcium	1.15
Potassium	0.14
Magnesium	0.11
Silica	208
Boron	15.4
Barium	0.187
Strontium	<0.020
Fluoride	0.350
Lithium	<0.020
Hydrogen Sulfide	8.15
Total Alkalinity, as HCO_3^-	2.01
Total Dissolved Solids	205
Total Suspended Solids	283



THERMOCHEM

5324 (1-5) December 30, 1993

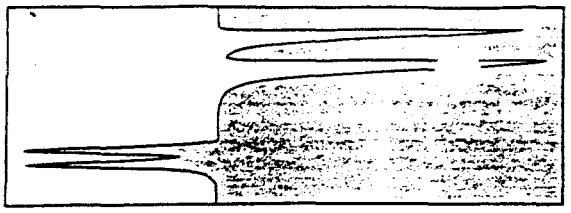
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5324–3

Descriptor: PGV Produced Brine KS-10 12-09-93 04:36

Analyte	mg/kg
Iron	1.18
Manganese	0.555
Sodium	6320
Chloride	11800
Calcium	137
Potassium	1470
Magnesium	0.13
Silica	1110
Boron	8.21
Barium	7.17
Strontium	7.09
Fluoride	<3.0
Lithium	2.45
Hydrogen Sulfide	4.84
Total Alkalinity, as HCO_3^-	<2.0
Total Dissolved Solids	21500



THERMOCHEM

5324 (1-5) December 30, 1993

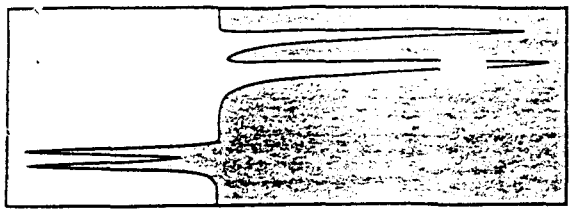
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5324–4

Descriptor: PGV Seal Water 12-09-93 05:46

Analyte	mg/kg
Iron	0.088
Manganese	0.00366
Sodium	75.0
Chloride	19.1
Sulfate	215
Silica	102
Calcium	22.4
Potassium	10.7
Magnesium	13.1
Total Dissolved Solids	440
Total Suspended Solids	3.0



THERMOCHEM

5324 (1-5) December 30, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5324–5

Descriptor: PGV Condensate 12-09-93 06:14

Analyte	mg/kg
Iron	0.026
Manganese	0.0005
Sodium	1.93
Chloride	0.630
Silica	2.77
Hydrogen Sulfide	455
Total Suspended Solids	3.0

THERMOCHEM

Sampled 11-04-93

5253 (1) November 18, 1993

Quality Control Data

Samples Received: November 9, 1993

Requested by: Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Analyte	Precision (% RSD)	External Standard (% Recovery)	Sample Spike (% Recovery)
Carbon Dioxide	0.3	104, 98	97
Hydrogen Sulfide	0.18	100	100
Ammonia	N/A	99.7, 102	101
Nitrogen	0.72	102	N/A
Methane	N/A	95	N/A
Hydrogen	2.4	101	N/A

Precision: Percent Relative Standard Deviation of replicate sample analyses.

External Standard: Percent Recovery of an independent audit standard analyzed against calibration standards (measured/known x 100).

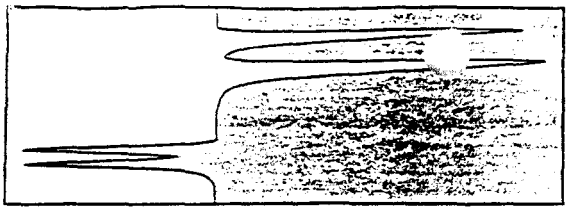
Sample Spike: Percent Recovery of a known quantity of standard added to sample (measured/theoretical x 100).

N/A: Not applicable.

Paul N. Hirtz
Director of Operations

Distribution: Greg Davidson
Tom Kizis

Laboratory & Consulting Services 4641 Skylane Boulevard Santa Rosa, CA 95403 (707) 576-1013



THERMOCHEM

5253 (1) November 18, 1993

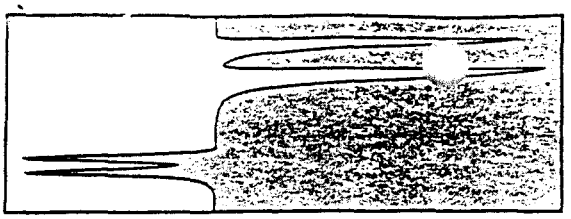
Descriptor: PGV STEAM HEADER 11-04-1993 05:27
MONTHLY TYPE I

Lab Number: 5253-01

Sample Gas/Steam Ratio (ft^3/lb):	0.0160
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	801
Sample Gas/Steam Ratio (ppm by weight):	1610
Percent Air in Sample:	0.024
STP Mls Air in Sample:	0.173
Total Weight of Condensate (grams):	727
Initial Headspace Pressure (psi):	12.60

Gas	Dry Gas % by Volume	Moles per 10^6 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.98 E +05
Carbon Dioxide	3.94 E +01	3.16 E +02	7.71 E +02
Hydrogen Sulfide	5.46 E +01	4.37 E +02	8.26 E +02
Ammonia	<3.28 E -02	<2.63 E -01	<2.48 E -01
Argon	1.10 E -02	8.85 E -02	1.96 E -01
Nitrogen	7.10 E -01	5.69 E +00	8.84 E +00
Methane	<2.94 E -02	<2.36 E -01	<2.10 E -01
Hydrogen	5.26 E +00	4.21 E +01	4.72 E +00

Radon (Pico Curies/Liter Dry Gas, STP):	2342
Radon (Pico Curies/Kg Steam):	2331



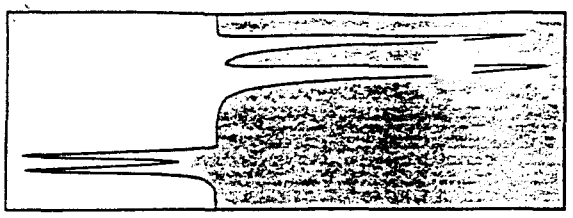
THERMOCHEM

Descriptor: STEAM HEADER 11-02-1992 07:52

Lab Number: 4584-01

Sample Gas/Steam Ratio (ft^3/lb):	0.0164
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	825
Sample Gas/Steam Ratio (ppm by weight):	1500
Percent Air in Sample:	0.076
STP Mls Air in Sample:	0.652
Total Weight of Condensate (grams):	840
Initial Headspace Pressure (psi):	5.32

Gas	Dry Gas % by Volume	Moles per 10^6 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	2.02 E +01	1.67 E +02	4.07 E +02
Hydrogen Sulfide	6.70 E +01	5.53 E +02	1.04 E +03
Ammonia	<3.12 E -02	<2.57 E -01	<2.43 E -01
Argon	5.86 E -02	4.84 E -01	1.07 E +00
Nitrogen	2.89 E +00	2.39 E +01	3.70 E +01
Methane	<6.64 E -02	<5.48 E -01	<4.87 E -01
Hydrogen	9.85 E +00	8.13 E +01	9.10 E +00



THERMOCHEM

5252 (1) December 13, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

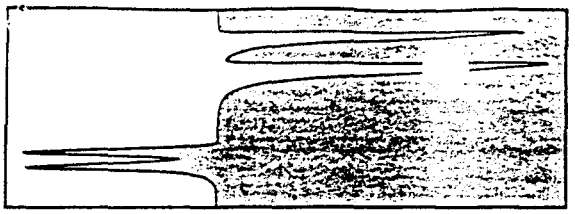
Report of Analysis

Lab Number: 5252–1

Descriptor: PGV Monthly Type I Injectate 11-04-93 06:25

Analyte	mg/kg
Sodium	561
Potassium	118
Calcium	10.2
Magnesium	0.33
Lithium	0.25
Silica	135
Boron	1.71
Barium	0.60
Arsenic	0.052
Selenium	<0.061
Mercury	<0.00025
Cadmium	<0.00031
Lead	<0.0012
Iron	0.23
Manganese	0.034
Nickel	<0.0061
Copper	<0.0024
Chromium	0.0084
Silver	<0.0012
Vanadium	0.012
Zinc	<0.12

Analyte	mg/kg
Chloride	1034
Fluoride	<2.5
Sulfate	14.3
Thiosulfate	<1.2
Nitrate	<1.0
Bromide	3.53
Total Alkalinity, as HCO_3^-	<2.0
pH, units	4.19
Ammonia	<0.2
Hydrogen Sulfide	538
Oil and Grease	<5
Total Dissolved Solids	1800
Total Suspended Solids	<1.0
Conductivity, umhos/cm	3370
Density, g/ml	0.998



THERMOCHEM

5251 (2) November 16, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

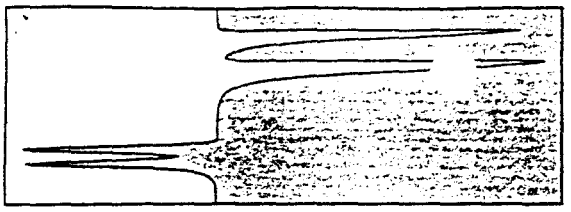
Report of Analysis

Lab Number: 5251–2

Descriptor: PGV KS-10 Brine 11-04-93 05:43

Analyte	mg/kg
Arsenic	<0.50
Boron	14.7
Silica	728
Sodium	3850
Potassium	876
Calcium	60.9
Magnesium	<0.20
Iron	0.79
Aluminum	<0.60
Lithium	1.80
Strontium	3.12
Zinc	<0.10
Silver	<0.10
Barium	4.34
Beryllium	<1.0
Bismuth	<2.40
Cadmium	<0.10
Cerium	<0.20
Cobalt	<0.02
Chromium	<0.10
Copper	<0.10
Manganese	<0.20
Molybdenum	<0.60
Nickel	<0.10
Lead	<0.20
Tin	<0.10
Antimony	<0.50
Vanadium	<1.20

Analyte	mg/kg
Chloride	6820
Bromide	23.0
Fluoride	<1
Total Alkalinity, as HCO_3^-	<2.0
Sulfate	9.32
Total Dissolved Solids	12000
Total Suspended Solids	1.4



THERMOCHEM

5251 (1,3,4,5) December 13, 1993

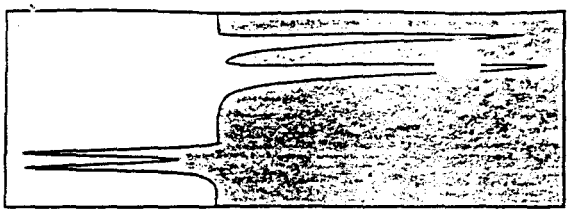
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5251–5

Descriptor: PGV Seal Water 11-04-93 07:05

Analyte	mg/kg
Iron	0.12
Manganese	0.0038
Sodium	72.7
Chloride	17.2
Calcium	22.4
Potassium	10.8
Magnesium	12.7
Silica	106
Sulfate	218
Total Alkalinity, as HCO_3^-	34.9
Total Dissolved Solids	470
Total Suspended Solids	<1.0



THERMOCHEM

5251 (1,3,4,5) December 13, 1993

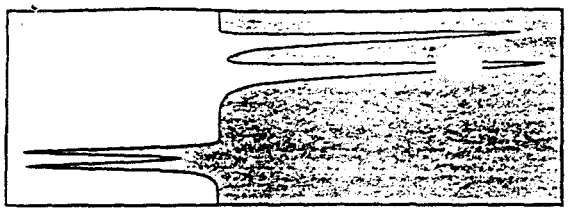
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5251–1

Descriptor: PVG Steam Header 11-04-93 05:32

Analyte	mg/kg
Iron	0.031
Manganese	0.00081
Sodium	0.65
Chloride	1.09
Silica	0.152



THERMOCHEM

5251 (1,3,4,5) December 13, 1993

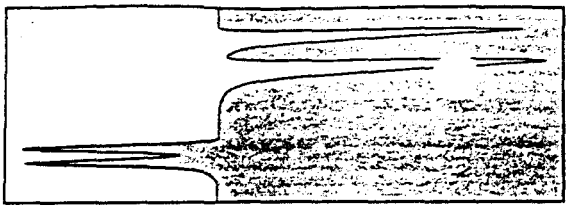
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5251–3

Descriptor: PGV Injectate 11-04-93 06:09

Analyte	mg/kg
Iron	0.36
Manganese	0.054
Sodium	541
Chloride	1080
Silica	143
Sulfate	12.2
Total Suspended Solids	<1.0



THERMOCHEM

5251 (1,3,4,5) December 13, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5251–4

Descriptor: PGV Condensate 11-04-93 06:45

Analyte	mg/kg
Iron	0.059
Manganese	0.0014
Sodium	2.39
Chloride	0.724
Silica	3.86
Sulfate	13.1
Total Suspended Solids	<1.0

5251 (2) November 11, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

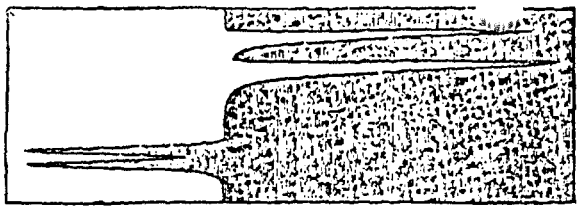
Lab Number	Descriptor	Chloride ppm
5251-2	PGV Brine 11-04-93 05:43	6820

5251 (1-5) November 11, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number	Descriptor	Silica ppm
5251-1	PGV Steam Header 11-04-93 05:32	0.152
5251-2	PGV Brine 11-04-93 05:43	728
5251-3	PGV Injectate 11-04-93 06:09	143
5251-4	PGV Condensate 11-04-93 06:45	3.86
5251-5	PGV Seal Water 11-04-93 07:05	106



THERMOCHEM

5251 (1,3,4,5) December 13, 1993

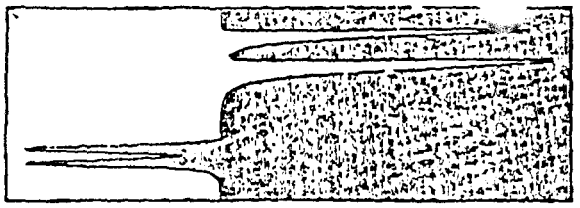
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5251-1

Descriptor: PVG Steam Header 11-04-93 05:32

Analyte	mg/kg
Iron	0.031
Manganese	0.00081
Sodium	0.65
Chloride	1.09
Silica	0.152



THERMOCHEM

5251 (2) November 16, 1993

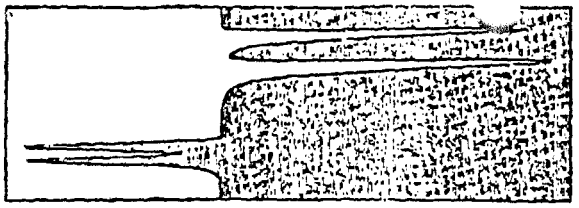
Report of Analysis

Lab Number: 5251–2

Descriptor: PGV KS-10 Brine 11-04-93 05:43

Analyte	mg/kg
Arsenic	<0.50
Boron	14.7
Silica	728
Sodium	3850
Potassium	876
Calcium	60.9
Magnesium	<0.20
Iron	0.79
Aluminum	<0.60
Lithium	1.80
Strontium	3.12
Zinc	<0.10
Silver	<0.10
Barium	4.34
Beryllium	<1.0
Bismuth	<2.40
Cadmium	<0.10
Cerium	<0.20
Cobalt	<0.02
Chromium	<0.10
Copper	<0.10
Manganese	<0.20
Molybdenum	<0.60
Nickel	<0.10
Lead	<0.20
Tin	<0.10
Antimony	<0.50
Vanadium	<1.20

Analyte	mg/kg
Chloride	6820
Bromide	23.0
Fluoride	<1
Total Alkalinity, as HCO_3^-	<2.0
Sulfate	9.32
Total Dissolved Solids	12000
Total Suspended Solids	1.4



THERMOCHEM

5251 (1,3,4,5) December 13, 1993

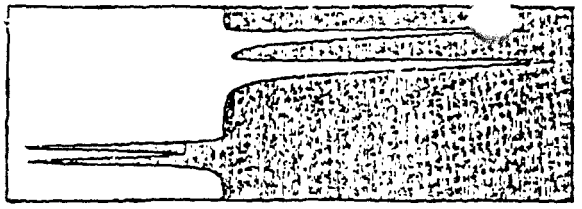
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5251-3

Descriptor: PGV Injectate 11-04-93 06:09

Analyte	mg/kg
Iron	0.36
Manganese	0.054
Sodium	541
Chloride	1080
Silica	143
Sulfate	12.2
Total Suspended Solids	<1.0



THERMOCHEM

5251 (1,3,4,5) December 13, 1993

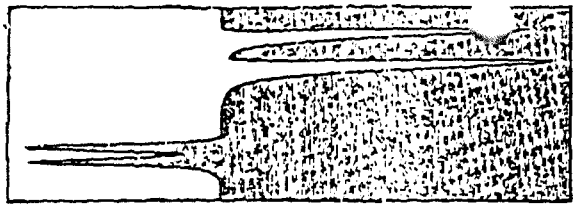
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5251-4

Descriptor: PGV Condensate 11-04-93 06:45

Analyte	mg/kg
Iron	0.059
Manganese	0.0014
Sodium	2.39
Chloride	0.724
Silica	3.86
Sulfate	13.1
Total Suspended Solids	<1.0



THERMOCHEM

5251 (1,3,4,5) December 13, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5251-5

Descriptor: PGV Seal Water 11-04-93 07:05

Analyte	mg/kg
Iron	0.12
Manganese	0.0038
Sodium	72.7
Chloride	17.2
Calcium	22.4
Potassium	10.8
Magnesium	12.7
Silica	106.
Sulfate	218
Total Alkalinity, as HCO_3^-	34.9
Total Dissolved Solids	470
Total Suspended Solids	<1.0

SAMP D 10-19-93

THERMOCHEM

5211 (1-2) November 18, 1993

Quality Control Data

Samples Received: October 21, 1993

Requested by: Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Analyte	Precision (% RSD)	External Standard (% Recovery)	Sample Spike (% Recovery)
Carbon Dioxide	2.6	99, 92	98
Hydrogen Sulfide	0.20	100	98
Ammonia	N/A	100, 102	99
Nitrogen	0.98	102	N/A
Methane	29	95	N/A
Hydrogen	3.3	101	N/A
Radon	0.85	N/A	N/A

Precision: Percent Relative Standard Deviation of replicate sample analyses.

External Standard: Percent Recovery of an independent audit standard analyzed against calibration standards (measured/known x 100).

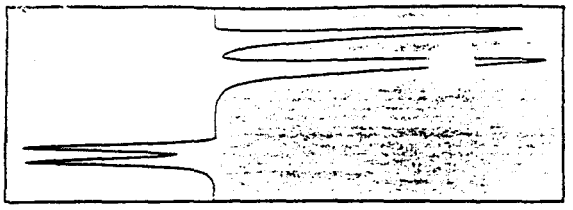
Sample Spike: Percent Recovery of a known quantity of standard added to sample (measured/theoretical x 100).

N/A: Not applicable.

Paul N. Hirtz
Director of Operations

Distribution: Greg Davidson
Tom Kizis

CLIENTSOESI/PGV/QA/5211QA.DOC



THERMOCHEM

5211 (1-2) November 18, 1993

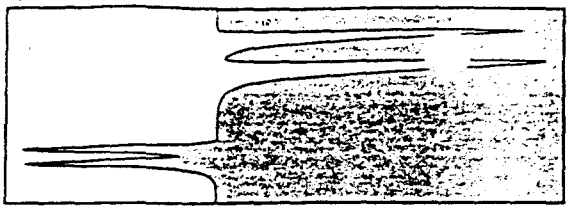
Descriptor: PGV STEAM HEADER 10-19-1993 07:45

Lab Number: 5211-01

Sample Gas/Steam Ratio (ft^3/lb):	0.0174
Sample Gas/Steam Ratio (moles per 10^3 moles H_2O):	871
Sample Gas/Steam Ratio (ppm by weight):	1710
Percent Air in Sample:	0.049
STP Mls Air in Sample:	0.388
Total Weight of Condensate (grams):	736
Initial Headspace Pressure (psi):	15.70

Gas	Dry Gas % by Volume	Moles per 10^3 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.98 E +05
Carbon Dioxide	3.82 E +01	3.33 E +02	8.11 E +02
Hydrogen Sulfide	5.38 E +01	4.69 E +02	8.84 E +02
Ammonia	<3.00 E -02	<2.61 E -01	<2.46 E -01
Argon	1.64 E -02	1.43 E -01	3.17 E -01
Nitrogen	8.91 E -01	7.77 E +00	1.21 E +01
Methane	1.90 E -02	1.65 E -01	1.47 E -01
Hydrogen	7.13 E +00	6.21 E +01	6.95 E +00

Radon (Pico Curies/Liter Dry Gas, STP):	2205
Radon (Pico Curies/Kg Steam):	2386



THERMOCHEM

5212 (1) December 3, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

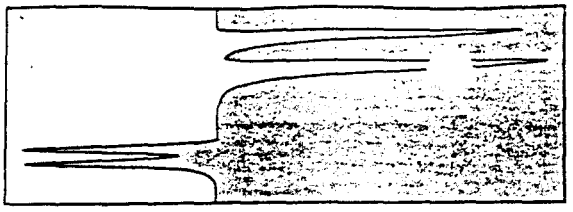
Report of Analysis

Lab Number: 5212–1

Descriptor: Monthly Type I Injectate 10-19-93 08:04

Analyte	mg/kg
Sodium	2.06
Potassium	0.32
Calcium	0.62
Magnesium	0.35
Lithium	<0.020
Silica	19.9
Boron	1.10
Barium	<0.012
Arsenic	0.015
Selenium	<0.061
Mercury	<0.00025
Cadmium	<0.00031
Lead	<0.0012
Iron	0.38
Manganese	0.016
Nickel	<0.0061
Copper	<0.0025
Chromium	<0.0012
Silver	<0.0012
Vanadium	<0.0060
Zinc	<0.24

Analyte	mg/kg
Chloride	0.613
Fluoride	0.085
Sulfate	11.6
Thiosulfate	<1.1
Nitrate	<0.5
Bromide	<0.5
Total Alkalinity, as HCO_3^-	<2.0
pH, units	3.88
Ammonia	<0.2
Hydrogen Sulfide	601
Oil and Grease	<5
Total Dissolved Solids	39
Total Suspended Solids	<1.0
Conductivity, umhos/cm	121
Density, g/ml	0.9999



THERMOCHEM

5213 (1-4) November 23, 1993

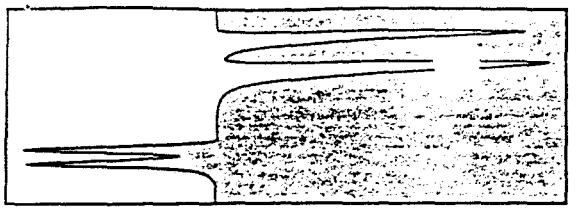
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5213–3

Descriptor: PGV Seal Water 10-19-93 09:21

Analyte	mg/kg
Iron	<0.050
Manganese	0.0034
Sodium	82.3
Chloride	17.9
Calcium	22.0
Potassium	10.7
Magnesium	13.0
Silica	109
Sulfate	226
Alkalinity	38.6
Total Dissolved Solids	520
Total Suspended Solids	<1.0
pH, units	7.26



THERMOCHEM

5213 (1-4) November 23, 1993

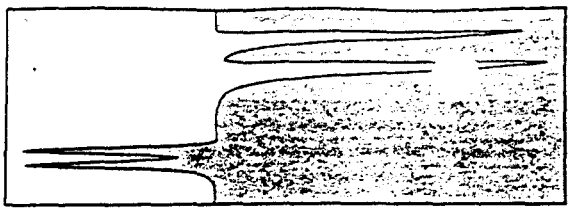
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5213–4

Descriptor: PGV Steam Header 10-19-93 07:52

Analyte	mg/kg
Iron	0.67
Manganese	0.0084
Sodium	0.012
Chloride	0.035
Silica	0.139



THERMOCHEM

5213 (1-4) November 23, 1993

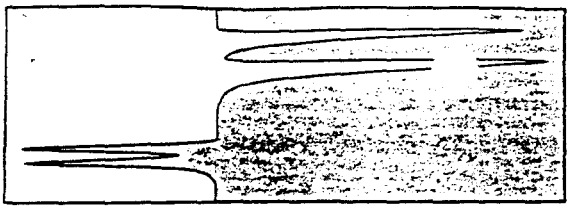
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5213–1

Descriptor: PGV Injectate 10-19-93 08:13

Analyte	mg/kg
Iron	0.28
Manganese	0.020
Sodium	2.07
Chloride	0.580
Silica	21.7
Sulfate	10.1
Total Suspended Solids	<1.0



THERMOCHEM

5213 (1-4) November 23, 1993

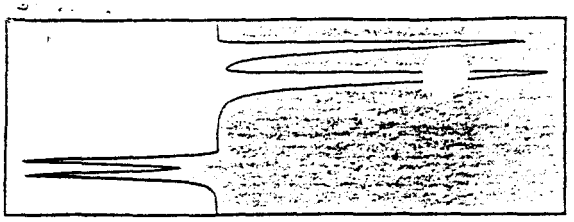
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5213–2

Descriptor: PGV Condensate 10-19-93 09:00

Analyte	mg/kg
Iron	0.18
Manganese	<0.00050
Sodium	1.71
Chloride	0.401
Silica	2.63
Sulfate	5.71
Total Suspended Solids	<1.0



THERMOCHEM

SAMPLED 9-01-93

5126 (1-2) September 23, 1993

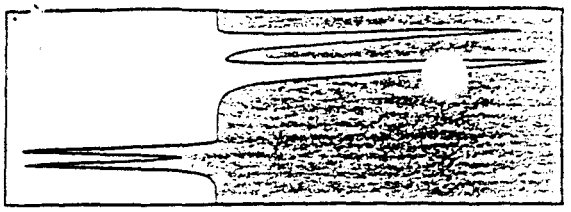
Descriptor: PGV STEAM HEADER 9-01-1993 08:15
MONTHLY TYPE 1

Lab Number: 5126-01

Sample Gas/Steam Ratio (ft^3/lb):	0.0150
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	754
Sample Gas/Steam Ratio (ppm by weight):	1460
Percent Air in Sample:	0.048
STP Mls Air in Sample:	0.485
Total Weight of Condensate (grams):	1090
Initial Headspace Pressure (psi):	14.60

Gas	Dry Gas % by Volume	Moles per 10^6 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	3.83 E +01	2.89 E +02	7.04 E +02
Hydrogen Sulfide	5.14 E +01	3.88 E +02	7.32 E +02
Ammonia	<3.25 E -02	<2.45 E -01	<2.32 E -01
Argon	2.04 E -02	1.54 E -01	3.41 E -01
Nitrogen	1.33 E +00	1.00 E +01	1.56 E +01
Methane	1.93 E -02	1.45 E -01	1.29 E -01
Hydrogen	8.99 E +00	6.78 E +01	7.59 E +00

Radon (Pico Curies/Liter Dry Gas, STP):	2429
Radon (Pico Curies/Kg Steam):	2276



THERMOCHEM

5126 (1-2) September 23, 1993

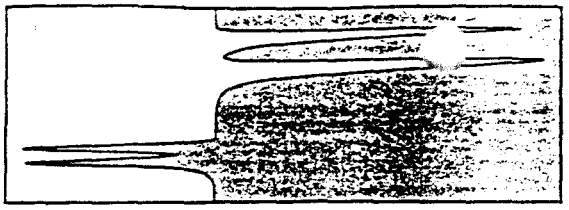
Descriptor: PGV STEAM HEADER 9-01-1993 08:15
MONTHLY TYPE 1

Lab Number: 5126-01

Sample Gas/Steam Ratio (ft^3/lb):	0.0150
Sample Gas/Steam Ratio (moles per 10^3 moles H_2O):	754
Sample Gas/Steam Ratio (ppm by weight):	1460
Percent Air in Sample:	0.048
STP Mls Air in Sample:	0.485
Total Weight of Condensate (grams):	1090
Initial Headspace Pressure (psi):	14.60

Gas	Dry Gas % by Volume	Moles per 10^3 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	3.83 E +01	2.89 E +02	7.04 E +02
Hydrogen Sulfide	5.14 E +01	3.88 E +02	7.32 E +02
Ammonia	<3.25 E -02	<2.45 E -01	<2.32 E -01
Argon	2.04 E -02	1.54 E -01	3.41 E -01
Nitrogen	1.33 E +00	1.00 E +01	1.56 E +01
Methane	1.93 E -02	1.45 E -01	1.29 E -01
Hydrogen	8.99 E +00	6.78 E +01	7.59 E +00

Radon (Pico Curies/Liter Dry Gas, STP):	2429
Radon (Pico Curies/Kg Steam):	2276



THERMOCHEM

5137 (1-5) October 7, 1993

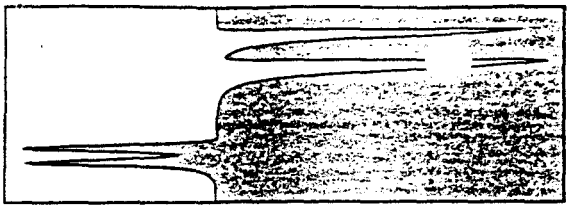
Report of Analysis

Lab Number: 5137–1

Descriptor: PGV Monthly Type I Injectate 09-01-93 0900

Analyte	mg/kg
Sodium	1.95
Lithium	<0.020
Silica	25.0
Boron	1.06
Barium	<0.013
Arsenic	0.022
Selenium	<0.064
Mercury	<0.00025
Cadmium	0.00050
Lead	<0.0064
Iron	0.16
Manganese	0.0083
Nickel	<0.0064
Copper	<0.0026
Chromium	<0.0013
Silver	<0.0013
Vanadium	<0.0064
Zinc	<0.013

Analyte	mg/kg
Chloride	0.565
Fluoride	0.071
Sulfate	16.4
Thiosulfate	17.7
Nitrate	<1.0
Bromide	<1.0
Total Alkalinity, as HCO_3^-	<2.0
Total Inorganic Carbon, as HCO_3^-	523
pH, units	4.20
Ammonia	0.603
Hydrogen Sulfide	673
Oil and Grease	<6
Total Dissolved Solids	27
Total Suspended Solids	<1.0
Conductivity, umhos/cm	52.2
Density, g/ml	0.995



THERMOCHEM

5137 (1-4) October 8, 1993

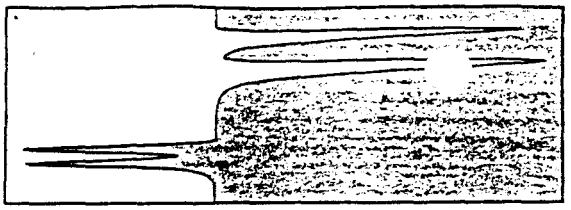
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5137–3

Descriptor: PGV Seal Water 09-01-93 07:57

Analyte	mg/kg
Sodium	88.8
Chloride	18.9
Silica	102
Iron	0.087
Manganese	0.0030
Calcium	21.1
Potassium	11.2
Magnesium	12.7
Sulfate	241
Total Alkalinity, as HCO_3^-	38.8
Total Dissolved Solids	450
Total Suspended Solids	<1.0
pH, units	6.51



THERMOCHEM

5137 (1-4) October 8, 1993

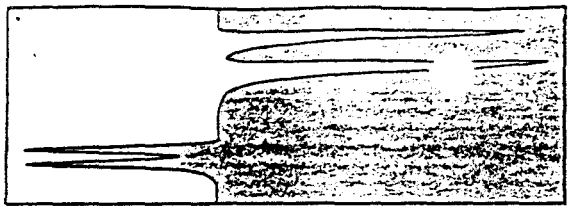
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5137–4

Descriptor: PGV Steam Header 09-01-93 08:19

Analyte	mg/kg
Sodium	0.070
Chloride	<0.025
Silica	0.285
Iron	0.18
Manganese	0.011



THERMOCHEM

5137 (1-5) October 7, 1993

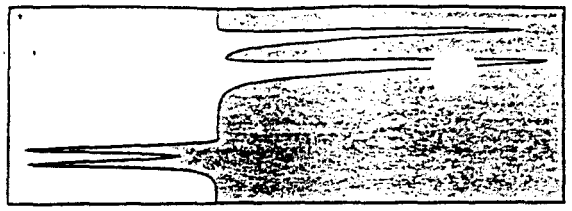
Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5137-2

Descriptor: PGV Condensate 09-01-93 06:35

Analyte	mg/kg
Sodium	1.76
Chloride	0.520
Silica	2.23
Iron	0.018
Manganese	<0.00050
Total Suspended Solids	<1.0
pH, units	3.99



THERMOCHEM

5137 (1-4) October 8, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number: 5137–5

Descriptor: PGV Injectate 09-01-93 08:42

Analyte	mg/kg
Sodium	1.51
Chloride	0.536
Silica	20.7
Iron	0.24
Manganese	0.015
Sulfate	14.5
Total Suspended Solids	<1.0
pH, units	3.85

PRODUCTION WELL DATA KS-9

Date	Hours	Steam	Brine	Total	AveTotMass ProdRate	AveWell Press	BrFrac
01-May-93	24	8692	2165	10857	452	1404	19.94%
02-May-93	24	10204	2738	12942	539	1237	21.16%
03-May-93	24	10283	2544	12827	534	1250	19.83%
04-May-93	24	10430	2660	13090	545	1316	20.32%
05-May-93	24	10330	2768	13098	546	1394	21.13%
06-May-93	24	9520	2508	12028	501	1120	20.85%
07-May-93	24	9386	2331	11717	488	1330	19.89%
08-May-93	24	9567	2452	12019	501	1400	20.40%
09-May-93	24	10545	2521	13066	544	1120	19.29%
10-May-93	24	10672	2584	13256	552	1100	19.49%
11-May-93	24	8829	2026	10855	452	1560	18.66%
12-May-93	24	10035	1937	11972	499	1280	16.18%
13-May-93	24	10685	1749	12434	518	1120	14.07%
14-May-93	24	10690	2370	13060	544	1200	18.15%
15-May-93	24	10956	2221	13177	549	1160	16.86%
16-May-93	24	10734	2542	13276	553	1120	19.15%
17-May-93	24	10781	2156	12937	539	1200	16.67%
18-May-93	24	10896	2499	13395	558	1080	18.66%
19-May-93	24	10863	2482	13345	556	1100	18.60%
20-May-93	24	10910	2232	13142	548	1100	16.98%
21-May-93	24	10840	2435	13275	553	1140	18.34%
22-May-93	24	10810	2351	13161	548	1140	17.86%
23-May-93	24	10788	2369	13157	548	1100	18.01%
24-May-93	24	10723	2350	13073	545	1060	17.98%
25-May-93	24	10853	2278	13131	547	1040	17.35%
26-May-93	24	10736	2030	12766	532	1060	15.90%
27-May-93	24	10980	2813	13793	575	1020	20.39%
28-May-93	24	11046	3404	14450	602	1000	23.56%
29-May-93	24	11090	1856	12946	539	1020	14.34%
30-May-93	24	10931	2504	13435	560	1020	18.64%
31-May-93	24	11090	2022	13112	546	1100	15.42%
01-Jun-93	24	10898	2603	13501	563	1063	19.28%
02-Jun-93	24	11031	2364	13395	558	985	17.65%
03-Jun-93	24	11173	2261	13434	560	810	16.83%
04-Jun-93	24	11255	2616	13871	578	735	18.86%
05-Jun-93	24	11291	3419	14710	613	679	23.24%
06-Jun-93	24	11235	1900	13135	547	585	14.47%
07-Jun-93	24	11242	2292	13534	564	783	16.94%
08-Jun-93	24	10868	2434	13302	554	810	18.30%
09-Jun-93	24	11290	2366	13656	569	975	17.33%
10-Jun-93	24	10811	2778	13589	566	875	20.44%
11-Jun-93	24	11120	2320	13440	560	833	17.26%
12-Jun-93	24	11049	2355	13404	559	808	17.57%
13-Jun-93	24	11144	2349	13493	562	840	17.41%

PRODUCTION WELL DATA KS-9

Date	Hours	Steam	Brine	Total	AveTotMass ProdRate	AveWell Press	BrFrac
14-Jun-93	24	10928	1795	12723	530	933	14.11%
15-Jun-93	24	10908	2713	13621	568	925	19.92%
16-Jun-93	24	10771	2484	13255	552	915	18.74%
17-Jun-93	24	11004	1611	12615	526	885	12.77%
18-Jun-93	24	10920	1201	12121	505	1000	9.91%
19-Jun-93	24	8400	924	9324	389	1540	9.91%
20-Jun-93	24	7560	832	8392	350	1628	9.91%
21-Jun-93	24	7080	779	7859	327	1675	9.91%
22-Jun-93	24	7080	779	7859	327	1670	9.91%
23-Jun-93	24	7320	805	8125	339	1650	9.91%
24-Jun-93	24	7200	792	7992	333	1660	9.91%
25-Jun-93	24	7200	792	7992	333	1660	9.91%
26-Jun-93	24	7200	792	7992	333	1655	9.91%
27-Jun-93	24	7080	779	7859	327	1668	9.91%
28-Jun-93	24	7440	818	8258	344	1635	9.91%
29-Jun-93	24	7680	845	8525	355	1630	9.91%
30-Jun-93	24	7440	818	8258	344	1635	9.91%
01-Jul-93	24	7248	896	8144	339	1655	11.00%
02-Jul-93	24	7440	920	8360	348	1640	11.00%
03-Jul-93	24	7440	920	8360	348	1635	11.00%
04-Jul-93	24	7368	911	8279	345	1645	11.00%
05-Jul-93	24	7440	920	8360	348	1638	11.00%
06-Jul-93	24	7368	911	8279	345	1645	11.00%
07-Jul-93	24	7512	928	8440	402	1623	11.00%
08-Jul-93	24	7680	949	8629	360	1609	11.00%
09-Jul-93	24	7320	905	8225	343	1650	11.00%
10-Jul-93	24	7512	928	8440	352	1625	11.00%
11-Jul-93	24	7608	940	8548	356	1615	11.00%
12-Jul-93	24	7728	955	8683	362	1605	11.00%
13-Jul-93	24	7680	949	8629	360	1610	11.00%
14-Jul-93	24	7920	979	8899	371	1588	11.00%
15-Jul-93	24	7728	955	8683	362	1606	11.00%
16-Jul-93	24	7776	961	8737	364	1603	11.00%
17-Jul-93	24	8208	1014	9222	384	1573	11.00%
18-Jul-93	24	7368	911	8279	345	1645	11.00%
19-Jul-93	24	7320	905	8225	343	1650	11.00%
20-Jul-93	24	7440	920	8360	348	1640	11.00%
21-Jul-93	24	7464	923	8387	349	1628	11.01%
22-Jul-93	24	7632	943	8575	357	1613	11.00%
23-Jul-93	24	7320	905	8225	343	1349	11.00%
24-Jul-93	24	7560	934	8494	354	1620	11.00%
25-Jul-93	24	7464	923	8387	349	1628	11.01%
26-Jul-93	24	7608	940	8548	356	1618	11.00%
27-Jul-93	24	7152	884	8036	335	1663	11.00%

PRODUCTION WELL DATA KS-9

Date	Hours	Steam	Brine	Total	AveTotMass ProdRate	AveWell Press	BrFrac
28-Jul-93	24	8304	1026	9330	389	1565	11.00%
29-Jul-93	24	8304	1026	9330	389	1565	11.00%
30-Jul-93	24	8328	1029	9357	390	1563	11.00%
31-Jul-93	24	8352	1032	9384	391	1561	11.00%
01-Aug-93	24	8184	1012	9196	341	1583	11.00%
02-Aug-93	24	8232	1017	9249	343	1570	11.00%
03-Aug-93	24	8304	1026	9330	346	1560	11.00%
04-Aug-93	24	8304	1026	9330	346	1556	11.00%
05-Aug-93	24	8040	994	9034	335	1595	11.00%
06-Aug-93	24	8112	1003	9115	338	1593	11.00%
07-Aug-93	24	8112	1003	9115	338	1590	11.00%
08-Aug-93	24	8112	1003	9115	338	1590	11.00%
09-Aug-93	24	8184	1012	9196	341	1579	11.00%
10-Aug-93	24	8112	1003	9115	338	1593	11.00%
11-Aug-93	24	8112	1003	9115	338	1590	11.00%
12-Aug-93	24	8184	1012	9196	341	1583	11.00%
13-Aug-93	24	8232	1017	9249	343	1570	11.00%
14-Aug-93	24	8112	1003	9115	338	1585	11.00%
15-Aug-93	24	8184	1012	9196	341	1580	11.00%
16-Aug-93	24	8184	1012	9196	341	1578	11.00%
17-Aug-93	24	8232	1017	9249	343	1570	11.00%
18-Aug-93	24	8304	1026	9330	346	1555	11.00%
19-Aug-93	24	8304	1026	9330	346	1560	11.00%
20-Aug-93	24	8232	1017	9249	343	1565	11.00%
21-Aug-93	24	8520	1053	9573	355	1534	11.00%
22-Aug-93	24	8304	1026	9330	346	1563	11.00%
23-Aug-93	24	8304	1026	9330	346	1555	11.00%
24-Aug-93	24	8376	1035	9411	349	1553	11.00%
25-Aug-93	24	8376	1035	9411	349	1545	11.00%
26-Aug-93	24	8376	1035	9411	349	1550	11.00%
27-Aug-93	24	8304	1026	9330	346	1560	11.00%
28-Aug-93	24	8376	1035	9411	349	1548	11.00%
29-Aug-93	24	8304	1026	9330	346	1558	11.00%
30-Aug-93	24	8448	1044	9492	352	1540	11.00%
31-Aug-93	24	8304	1026	9330	346	1555	11.00%
01-Sep-93	24	8184	1012	9196	383	1575	11.00%
02-Sep-93	24	8304	1026	9330	389	1555	11.00%
03-Sep-93	24	8232	1017	9249	385	1565	11.00%
04-Sep-93	24	9120	1127	10247	427	1453	11.00%
05-Sep-93	24	9048	1118	10166	424	1456	11.00%
06-Sep-93	24	8232	1017	9249	385	1566	11.00%
07-Sep-93	24	8112	1003	9115	380	1585	11.00%
08-Sep-93	24	8112	1003	9115	380	1585	11.00%
09-Sep-93	24	8112	1003	9115	380	1585	11.00%

PRODUCTION WELL DATA KS-9

Date	Hours	Steam	Brine	Total	AveTotMass ProdRate	AveWell Press	BrFrac
10-Sep-93	24	8112	1003	9115	380	1586	11.00%
11-Sep-93	24	8184	1012	9196	383	1580	11.00%
12-Sep-93	24	8304	1026	9330	389	1560	11.00%
13-Sep-93	24	8448	1044	9492	396	1540	11.00%
14-Sep-93	24	8448	1044	9492	396	1538	11.00%
15-Sep-93	24	8592	1062	9654	402	1516	11.00%
16-Sep-93	24	8592	1062	9654	402	1518	11.00%
17-Sep-93	24	8184	1012	9196	383	1584	11.00%
18-Sep-93	24	8520	1052	9572	399	1530	10.99%
19-Sep-93	24	8592	1062	9654	402	1519	11.00%
20-Sep-93	24	8760	1083	9843	410	1495	11.00%
21-Sep-93	24	8520	1053	9573	399	1531	11.00%
22-Sep-93	24	8832	1092	9924	413	1486	11.00%
23-Sep-93	24	8760	1083	9843	410	1500	11.00%
24-Sep-93	23	0	0	0	0	1720	ERR
25-Sep-93	0	0	0	0	0	1720	ERR
26-Sep-93	0	0	0	0	0	1720	ERR
27-Sep-93	0	0	0	0	0	1720	ERR
28-Sep-93	0	0	0	0	0	1680	ERR
29-Sep-93	0	0	0	0	0	1680	ERR
30-Sep-93	0	0	0	0	0	1680	ERR
01-Oct-93	0	0	0	0	0	1680	ERR
02-Oct-93	0	0	0	0	0	1680	ERR
03-Oct-93	0	0	0	0	0	1660	ERR
04-Oct-93	0	0	0	0	0	1660	ERR
05-Oct-93	0	0	0	0	0	1640	ERR
06-Oct-93	0	0	0	0	0	1600	ERR
07-Oct-93	0	0	0	0	0	1520	ERR
08-Oct-93	0	0	0	0	0	1520	ERR
09-Oct-93	0	0	0	0	0	1520	ERR
10-Oct-93	0	0	0	0	0	1520	ERR
11-Oct-93	0	0	0	0	0	1520	ERR
12-Oct-93	0	0	0	0	0	1520	ERR
13-Oct-93	0	0	0	0	0	1660	ERR
14-Oct-93	0	0	0	0	0	1660	ERR
15-Oct-93	0	0	0	0	0	1640	ERR
16-Oct-93	0	0	0	0	0	1650	ERR
17-Oct-93	0	0	0	0	0	1640	ERR
18-Oct-93	0	0	0	0	0	1640	ERR
19-Oct-93	0	0	0	0	0	1620	ERR
20-Oct-93	0	0	0	0	0	1610	ERR
21-Oct-93	0	0	0	0	0	1580	ERR
22-Oct-93	0	0	0	0	0	1545	ERR
23-Oct-93	0	0	0	0	0	1540	ERR

PRODUCTION WELL DATA KS-9

Date	Hours	Steam	Brine	Total	AveTotMass ProdRate	AveWell Press	BrFrac
24-Oct-93	0	0	0	0	0	1540	ERR
25-Oct-93	0	0	0	0	0	1520	ERR
26-Oct-93	0	0	0	0	0	1520	ERR
27-Oct-93	0	0	0	0	0	1520	ERR
28-Oct-93	0	0	0	0	0	1520	ERR
29-Oct-93	0	0	0	0	0	1520	ERR
30-Oct-93	0	0	0	0	0	1520	ERR
31-Oct-93	0	0	0	0	0	1520	ERR
01-Nov-93	0	0	0	0	0	1520	ERR
02-Nov-93	0	0	0	0	0	1520	ERR
03-Nov-93	0	0	0	0	0	1520	ERR
04-Nov-93	0	0	0	0	0	1520	ERR
05-Nov-93	0	0	0	0	0	1520	ERR
06-Nov-93	0	0	0	0	0	1520	ERR
07-Nov-93	0	0	0	0	0	1520	ERR
08-Nov-93	0	0	0	0	0	1520	ERR
09-Nov-93	0	0	0	0	0	1520	ERR
10-Nov-93	0	0	0	0	0	1520	ERR
11-Nov-93	8	1440	142	1582	198	1490	8.98%
12-Nov-93	24	6840	676	7516	313	1262	8.99%
13-Nov-93	24	7680	760	8440	352	1115	9.00%
14-Nov-93	24	7680	760	8440	352	1115	9.00%
15-Nov-93	24	7560	748	8308	346	1143	9.00%
16-Nov-93	24	7680	760	8440	352	1080	9.00%
17-Nov-93	24	7680	760	8440	352	1105	9.00%
18-Nov-93	24	7680	760	8440	352	1036	9.00%
19-Nov-93	24	8400	831	9231	385	990	9.00%
20-Nov-93	24	7650	757	8407	350	1095	9.00%
21-Nov-93	24	8160	807	8967	374	1004	9.00%
22-Nov-93	24	7680	760	8440	352	1040	9.00%
23-Nov-93	24	7680	760	8440	352	1030	9.00%
24-Nov-93	24	7680	760	8440	352	1050	9.00%
25-Nov-93	24	8640	855	9495	396	923	9.00%
26-Nov-93	24	8640	855	9495	396	938	9.00%
27-Nov-93	24	3540	350	3890	324	1185	9.00%
28-Nov-93	24	7320	724	8044	335	1145	9.00%
29-Nov-93	24	7560	748	8308	346	1115	9.00%
30-Nov-93	24	7560	748	8308	346	1040	9.00%
01-Dec-93	24	6480	641	7121	297	1225	9.00%
02-Dec-93	24	8640	855	9495	396	900	9.00%
03-Dec-93	24	8640	855	9495	396	885	9.00%
04-Dec-93	24	8640	855	9495	396	895	9.00%
05-Dec-93	24	8880	878	9758	407	845	9.00%
06-Dec-93	24	9000	890	9890	412	800	9.00%

PRODUCTION WELL DATA KS-9

Date	Hours	Steam	Brine	Total	AveTotMass ProdRate	AveWell Press	BrFrac
07-Dec-93	24	8880	878	9758	407	840	9.00%
08-Dec-93	24	8880	878	9758	407	845	9.00%
09-Dec-93	24	9120	902	10022	418	780	9.00%
10-Dec-93	24	9360	926	10286	429	693	9.00%
11-Dec-93	24	9600	949	10549	434	555	9.00%
12-Dec-93	24	9600	949	10549	434	545	9.00%
13-Dec-93	24	9000	890	9890	412	760	9.00%
14-Dec-93	24	9240	914	10154	423	708	9.00%
15-Dec-93	24	9360	926	10286	429	685	9.00%
16-Dec-93	24	9552	945	10497	412	660	9.00%
17-Dec-93	24	9120	902	10022	418	715	9.00%
18-Dec-93	24	9360	926	10286	429	618	9.00%
19-Dec-93	24	9600	949	10549	434	590	9.00%
20-Dec-93	24	9600	949	10549	434	598	9.00%
21-Dec-93	24	9360	926	10286	429	680	9.00%
22-Dec-93	24	9480	938	10418	434	623	9.00%
23-Dec-93	24	9120	902	10022	412	737	9.00%
24-Dec-93	24	9240	914	10154	423	690	9.00%
25-Dec-93	24	9600	949	10549	434	560	9.00%
26-Dec-93	24	9600	949	10549	434	503	9.00%
27-Dec-93	24	9480	938	10418	434	624	9.00%
28-Dec-93	24	9360	926	10286	429	688	9.00%
29-Dec-93	24	9360	926	10286	429	628	9.00%
30-Dec-93	24	9600	949	10549	440	598	9.00%
31-Dec-93	24	8040	795	8835	368	850	9.00%

PRODUCTION WELL DATA

Date	Hours	Steam	Brine	Total	AveTotMas ProdRate	AveWell Press	BrFrac
01-May-93	0	0	0	0	0	1050	0.00%
02-May-93	0	0	0	0	0	1050	0.00%
03-May-93	0	0	0	0	0	1050	0.00%
04-May-93	0	0	0	0	0	1050	0.00%
05-May-93	0	0	0	0	0	1050	0.00%
06-May-93	0	0	0	0	0	1050	0.00%
07-May-93	0	0	0	0	0	1050	0.00%
08-May-93	0	0	0	0	0	1050	0.00%
09-May-93	0	0	0	0	0	1050	0.00%
10-May-93	0	0	0	0	0	1050	0.00%
11-May-93	0	0	0	0	0	1050	0.00%
12-May-93	0	0	0	0	0	1050	0.00%
13-May-93	0	0	0	0	0	1050	0.00%
14-May-93	0	0	0	0	0	1050	0.00%
15-May-93	0	0	0	0	0	1050	0.00%
16-May-93	0	0	0	0	0	1050	0.00%
17-May-93	0	0	0	0	0	1050	0.00%
18-May-93	0	0	0	0	0	1040	0.00%
19-May-93	0	0	0	0	0	1040	0.00%
20-May-93	0	0	0	0	0	1220	0.00%
21-May-93	0	0	0	0	0	1120	0.00%
22-May-93	0	0	0	0	0	1040	0.00%
23-May-93	0	0	0	0	0	1040	0.00%
24-May-93	0	0	0	0	0	1060	0.00%
25-May-93	0	0	0	0	0	1040	0.00%
26-May-93	0	0	0	0	0	2000	0.00%
27-May-93	0	0	0	0	0	1700	0.00%
28-May-93	0	0	0	0	0	1360	0.00%
29-May-93	0	0	0	0	0	1275	0.00%
30-May-93	0	0	0	0	0	1190	0.00%
31-May-93	0	0	0	0	0	1060	0.00%
01-Jun-93	0	0	0	0	0	1060	0.00%
02-Jun-93	0	0	0	0	0	1060	0.00%
03-Jun-93	0	0	0	0	0	1060	0.00%
04-Jun-93	0	0	0	0	0	1060	0.00%
05-Jun-93	0	0	0	0	0	1060	0.00%
06-Jun-93	0	0	0	0	0	1060	0.00%
07-Jun-93	0	0	0	0	0	1060	0.00%
08-Jun-93	0	0	0	0	0	1060	0.00%
09-Jun-93	0	0	0	0	0	1060	0.00%
10-Jun-93	0	0	0	0	0	1060	0.00%
11-Jun-93	0	0	0	0	0	1060	0.00%
12-Jun-93	0	0	0	0	0	1080	0.00%
13-Jun-93	0	0	0	0	0	1080	0.00%

PRODUCTION WELL DATA

Date	Hours	Steam	Brine	Total	AveTotMas ProdRate	AveWell Press	BrFrac
14-Jun-93	0	0	0	0	0	1080	0.00%
15-Jun-93	0	0	0	0	0	1080	0.00%
16-Jun-93	0	0	0	0	0	1080	0.00%
17-Jun-93	3	352	151	503	168	1790	30.02%
18-Jun-93	11	845	1400	2245	204	1770	62.36%
19-Jun-93	24	2900	1507	4407	184	1700	34.20%
20-Jun-93	24	3680	2844	6524	272	1680	43.59%
21-Jun-93	24	4262	2162	6424	268	1680	33.66%
22-Jun-93	24	4368	1928	6296	262	1669	30.62%
23-Jun-93	24	4147	2340	6487	270	1590	36.07%
24-Jun-93	24	4103	2455	6558	273	1668	37.44%
25-Jun-93	24	4310	3124	7434	310	1665	42.02%
26-Jun-93	24	4068	1957	6025	251	1660	32.48%
27-Jun-93	24	3242	1698	4940	206	1660	34.37%
28-Jun-93	24	4275	2204	6479	270	1643	34.02%
29-Jun-93	24	4565	2061	6626	276	1635	31.10%
30-Jun-93	24	4744	2521	7265	303	1635	34.70%
01-Jul-93	24	4312	883	5195	216	1655	17.00%
02-Jul-93	24	3962	775	4737	197	1640	16.36%
03-Jul-93	24	3975	792	4767	199	1640	16.61%
04-Jul-93	24	3921	801	4722	197	1625	16.96%
05-Jul-93	24	3743	794	4537	189	1615	17.50%
06-Jul-93	24	4189	791	4980	208	1620	15.88%
07-Jul-93	24	3268	558	3826	182	1635	14.58%
08-Jul-93	24	3814	760	4574	191	1630	16.62%
09-Jul-93	24	3931	761	4692	195	1643	16.22%
10-Jul-93	24	3918	605	4523	188	1638	13.38%
11-Jul-93	24	3870	773	4643	193	1618	16.65%
12-Jul-93	24	3904	852	4756	198	1621	17.91%
13-Jul-93	24	4130	666	4796	200	1615	13.89%
14-Jul-93	24	3966	636	4602	192	1610	13.82%
15-Jul-93	24	4061	590	4651	194	1613	12.69%
16-Jul-93	24	3694	801	4495	187	1615	17.82%
17-Jul-93	24	3541	590	4131	172	1598	14.28%
18-Jul-93	24	4222	651	4873	203	1603	13.36%
19-Jul-93	24	3424	561	3985	166	1618	14.08%
20-Jul-93	24	3207	566	3773	157	1626	15.00%
21-Jul-93	24	2536	480	3016	126	1628	15.92%
22-Jul-93	24	3468	515	3983	166	1633	12.93%
23-Jul-93	24	3180	533	3713	212	1627	14.35%
24-Jul-93	24	3236	576	3812	159	1635	15.11%
25-Jul-93	24	2889	552	3441	143	1638	16.04%
26-Jul-93	24	2973	513	3486	145	1625	14.72%
27-Jul-93	24	4110	622	4732	197	1548	13.14%

PRODUCTION WELL DATA

Date	Hours	Steam	Brine	Total	AveTotMas ProdRate	AveWell Press	BrFrac
28-Jul-93	24	3364	525	3889	162	1590	13.50%
29-Jul-93	24	3261	519	3780	158	1596	13.73%
30-Jul-93	24	3377	517	3894	162	1600	13.28%
31-Jul-93	24	3248	503	3751	156	1603	13.41%
01-Aug-93	24	2905	686	3591	150	1585	19.10%
02-Aug-93	24	3523	251	3774	157	1605	6.65%
03-Aug-93	24	3298	476	3774	157	1570	12.61%
04-Aug-93	24	3450	512	3962	165	1595	12.92%
05-Aug-93	24	2260	346	2606	109	1608	13.28%
06-Aug-93	24	2578	351	2929	122	1608	11.98%
07-Aug-93	24	2608	364	2972	124	1605	12.25%
08-Aug-93	24	1688	242	1930	80	1608	12.54%
09-Aug-93	24	2649	362	3011	125	1600	12.02%
10-Aug-93	24	2539	310	2849	119	1600	10.88%
11-Aug-93	24	2834	348	3182	133	1603	10.94%
12-Aug-93	24	2384	312	2696	112	1605	11.57%
13-Aug-93	24	2698	345	3043	127	1599	11.34%
14-Aug-93	24	2678	313	2991	125	1598	10.46%
15-Aug-93	24	2748	346	3094	129	1588	11.18%
16-Aug-93	24	2643	342	2985	124	1593	11.46%
17-Aug-93	24	2651	308	2959	123	1585	10.41%
18-Aug-93	24	2391	298	2689	112	1580	11.08%
19-Aug-93	24	3341	329	3670	153	1580	8.96%
20-Aug-93	24	1997	314	2311	96	1585	13.59%
21-Aug-93	24	2331	295	2626	109	1578	11.23%
22-Aug-93	24	2520	284	2804	117	1588	10.13%
23-Aug-93	24	2552	300	2852	119	1574	10.52%
24-Aug-93	24	2509	264	2773	116	1575	9.52%
25-Aug-93	24	2230	251	2481	103	1565	10.12%
26-Aug-93	24	2295	243	2538	106	1563	9.57%
27-Aug-93	24	3808	421	4229	176	1555	9.96%
28-Aug-93	24	1850	177	2027	84	1555	8.73%
29-Aug-93	24	2681	291	2972	124	1563	9.79%
30-Aug-93	24	2662	249	2911	121	1545	8.55%
31-Aug-93	24	2676	285	2961	123	1553	9.63%
01-Sep-93	24	2441	266	2707	113	1560	9.83%
02-Sep-93	24	2432	220	2652	110	1548	8.30%
03-Sep-93	24	2525	258	2783	116	1550	9.27%
04-Sep-93	24	2244	265	2509	105	1560	10.56%
05-Sep-93	24	2531	202	2733	114	1510	7.39%
06-Sep-93	24	3332	328	3660	152	1480	8.96%
07-Sep-93	24	1888	192	2080	87	1568	9.23%
08-Sep-93	24	1748	179	1927	80	1565	9.29%
09-Sep-93	24	1728	163	1891	79	1563	8.62%

PRODUCTION WELL DATA

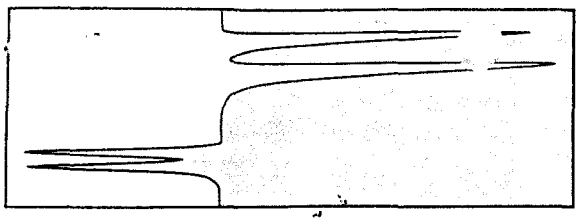
Date	Hours	Steam	Brine	Total	AveTotMas ProdRate	AveWell Press	BrFrac
10-Sep-93	24	1920	179	2099	87	1561	8.53%
11-Sep-93	24	2258	223	2481	103	1560	8.99%
12-Sep-93	24	2241	204	2445	102	1550	8.34%
13-Sep-93	24	2094	172	2266	94	1541	7.59%
14-Sep-93	24	2126	191	2317	97	1550	8.24%
15-Sep-93	24	2113	174	2287	95	1528	7.61%
16-Sep-93	24	2208	187	2395	100	1533	7.81%
17-Sep-93	24	351	4	355	15	1547	1.13%
18-Sep-93	24	1931	156	2087	87	1533	7.47%
19-Sep-93	24	1972	163	2135	89	1535	7.63%
20-Sep-93	24	1687	119	1806	75	1530	6.59%
21-Sep-93	24	2240	150	2390	100	1515	6.28%
22-Sep-93	24	1771	153	1924	80	1525	7.95%
23-Sep-93	24	1840	131	1971	82	1523	6.65%
24-Sep-93	21.5	10000	1112	11112	517	1560	10.01%
25-Sep-93	0	0	0	0	0	1100	0.00%
26-Sep-93	0	0	0	0	0	1060	0.00%
27-Sep-93	0	0	0	0	0	1060	0.00%
28-Sep-93	12	2020	346	2366	197	1180	14.62%
29-Sep-93	24	8568	1090	9658	402	1158	11.29%
30-Sep-93	24	8711	1113	9824	409	1200	11.33%
01-Oct-93	24	8818	1133	9951	415	1090	11.39%
02-Oct-93	24	9164	1091	10255	427	1141	10.64%
03-Oct-93	24	8056	1101	9157	382	1101	12.02%
04-Oct-93	24	8781	1125	9906	413	1005	11.36%
05-Oct-93	24	8920	1145	10065	419	1020	11.38%
06-Oct-93	24	10204	1107	11311	471	1025	9.79%
07-Oct-93	24	10129	1100	11229	468	1015	9.80%
08-Oct-93	24	10502	1156	11658	486	910	9.92%
09-Oct-93	24	10480	1144	11624	484	868	9.84%
10-Oct-93	24	10575	1148	11723	488	838	9.79%
11-Oct-93	24	10320	1127	11447	477	909	9.85%
12-Oct-93	24	10230	1090	11320	472	945	9.63%
13-Oct-93	24	10477	1132	11609	484	870	9.75%
14-Oct-93	24	10057	1177	11234	468	908	10.48%
15-Oct-93	24	10476	1350	11826	493	850	11.42%
16-Oct-93	24	10563	935	11498	479	850	8.13%
17-Oct-93	24	10377	1106	11483	478	860	9.63%
18-Oct-93	24	11811	1105	12916	538	874	8.56%
19-Oct-93	24	10605	1358	11963	498	935	11.35%
20-Oct-93	24	8216	1027	9243	398	865	11.11%
21-Oct-93	24	10428	1147	11575	482	869	9.91%
22-Oct-93	24	10330	1106	11436	477	860	9.67%
23-Oct-93	24	10210	1092	11302	471	874	9.66%

PRODUCTION WELL DATA

Date	Hours	Steam	Brine	Total	AveTotMas ProdRate	AveWell Press	BrFrac
24-Oct-93	24	10370	1130	11500	479	855	9.83%
25-Oct-93	24	10360	1093	11453	477	890	9.54%
26-Oct-93	24	10210	1092	11302	471	873	9.66%
27-Oct-93	24	9731	1038	10769	449	1036	9.64%
28-Oct-93	24	10500	1114	11614	484	898	9.59%
29-Oct-93	24	10460	1109	11569	482	810	9.59%
30-Oct-93	24	10265	1096	11361	473	870	9.65%
31-Oct-93	24	9963	1079	11042	460	980	9.77%
01-Nov-93	24	7000	832	7832	326	1007	10.62%
02-Nov-93	24	10211	1469	11680	287	809	12.58%
03-Nov-93	24	10201	2262	12463	519	844	18.15%
04-Nov-93	24	10100	2723	12823	534	770	21.24%
05-Nov-93	24	10171	2945	13116	547	715	22.45%
06-Nov-93	24	10111	3148	13259	552	758	23.74%
07-Nov-93	24	10146	2494	12640	568	773	19.73%
08-Nov-93	24	9510	2533	12043	502	858	21.03%
09-Nov-93	24	7762	2027	9789	445	793	20.71%
10-Nov-93	24	10100	2726	12826	534	673	21.25%
11-Nov-93	24	8260	2861	11121	463	1120	25.73%
12-Nov-93	24	3260	1840	5100	212	1453	36.08%
13-Nov-93	24	2605	1851	4456	186	1458	41.54%
14-Nov-93	24	2734	2289	5023	209	1420	45.57%
15-Nov-93	24	2625	2314	4939	206	1425	46.85%
16-Nov-93	24	2543	1652	4195	175	1423	39.38%
17-Nov-93	24	2313	1964	4277	178	1420	45.92%
18-Nov-93	24	2420	1963	4383	183	1411	44.79%
19-Nov-93	24	1700	1988	3688	165	1398	53.90%
20-Nov-93	24	2550	2201	4751	198	1385	46.33%
21-Nov-93	24	1882	2185	4067	169	1378	53.73%
22-Nov-93	24	2176	2214	4390	183	1375	50.43%
23-Nov-93	24	2215	2166	4381	183	1373	49.44%
24-Nov-93	24	2210	2234	4444	185	1028	50.27%
25-Nov-93	24	1177	2122	3299	137	1363	64.32%
26-Nov-93	24	1260	2026	3286	137	1345	61.66%
27-Nov-93	24	1160	619	1779	148	1450	34.79%
28-Nov-93	24	2680	2197	4877	203	1402	45.05%
29-Nov-93	24	2561	2165	4726	197	1390	45.81%
30-Nov-93	24	2322	2151	4473	186	1370	48.09%
01-Dec-93	24	3617	2332	5949	248	1357	39.20%
02-Dec-93	24	1474	2218	3692	154	1335	60.08%
03-Dec-93	24	1420	2105	3525	147	1310	59.72%
04-Dec-93	24	1430	2005	3435	143	1268	58.37%
05-Dec-93	24	1370	2047	3417	142	1245	59.91%
06-Dec-93	24	1210	2100	3310	138	1275	63.44%

PRODUCTION WELL DATA

Date	Hours	Steam	Brine	Total	AveTotMas ProdRate	AveWell Press	BrFrac
07-Dec-93	24	536	1834	2370	99	1228	77.38%
08-Dec-93	24	1276	2238	3514	146	1255	63.69%
09-Dec-93	24	964	2361	3325	139	1172	71.01%
10-Dec-93	24	480	2285	2765	115	1140	82.64%
11-Dec-93	24	320	2372	2692	112	1125	88.11%
12-Dec-93	24	520	2279	2799	117	1155	81.42%
13-Dec-93	24	1070	2330	3400	142	1143	68.53%
14-Dec-93	24	790	2230	3020	126	1070	73.84%
15-Dec-93	24	733	1905	2638	110	1040	72.21%
16-Dec-93	24	789	2263	3052	127	1060	74.15%
17-Dec-93	24	1197	2582	3779	157	1033	68.32%
18-Dec-93	24	1038	2442	3480	145	1030	70.17%
19-Dec-93	24	982	2574	3556	148	1043	72.38%
20-Dec-93	24	685	2456	3141	131	1048	78.19%
21-Dec-93	24	957	2463	3420	142	1030	72.02%
22-Dec-93	24	710	2364	3074	128	960	76.90%
23-Dec-93	24	268	1871	2139	89	953	87.47%
24-Dec-93	24	929	1896	2825	118	970	67.12%
25-Dec-93	24	548	2089	2637	110	993	79.22%
26-Dec-93	24	462	1391	1853	77	993	75.07%
27-Dec-93	24	822	1923	2745	114	1135	70.05%
28-Dec-93	24	979	2305	3284	137	1059	70.19%
29-Dec-93	24	1134	2335	3469	145	928	67.31%
30-Dec-93	24	800	2371	3171	132	923	74.77%
31-Dec-93	24	1462	2217	3679	153	985	60.26%



THERMOCHEM

4965 (1-8) August 6, 1993

Report of Analysis

Report Type: KS-10 Clean-out Operation, PTO permit condition 20

Lab Number: 4965–01, 4951-2, 4953-1,2

Collection Date: 06-17-93

Well Name: KS-10

Collection Time: 18:00

Sample Point: Two-phase flow line, bottom port, sampling separator

Sample Type: Geothermal Water

Wellhead Pressure: 1800 psig

Lip Pressure: 3.5 psig

Separation Pressure: 40 psig

Total Flowrate: 177 KPH

Analyte	mg/kg
Sodium	22.3
Potassium	24.8
Calcium	1.47
Magnesium	0.91
Lithium	0.18
Strontium	0.024
Silica	151
Boron	7.93
Arsenic	0.076
Mercury	<0.00025
Cadmium	<0.00025
Beryllium	<0.00025
Lead	<0.0010
Iron	1.44
Manganese	0.063

Analyte	mg/kg
Chloride	3.93
Fluoride	0.235
Sulfate	50.2
Nitrate	<0.1
Bromide	<0.1
Total Alkalinity, as HCO_3^-	17.1
pH, units	7.62
Total Inorganic Carbon, as CO_2	<4
Ammonia	0.20
Hydrogen Sulfide	11.2
Total Dissolved Solids	300
Total Suspended Solids	66
Gross Alpha	0 ± 4 pCi/ℓ
Gross Beta	46 ± 6 pCi/ℓ
Total Asbestos	<0.28 MFL

Note: MFL=Million Fibers per Liter

THERMOCHEM

4965-01 (1-8) August 6, 1993

Report of Analysis

Report Type: KS-10 Clean-out Operation, PTO permit condition 20

Lab Number: 4965–02, 4951-3, 4953-3,4

Collection Date: 06-17-93

Well Name: KS-10

Collection Time: 18:40

Sample Point: Two-phase flow line, bottom port, sampling separator

Sample Type: Geothermal Water

Wellhead Pressure: 1785 psig

Lip Pressure: 7.0 psig

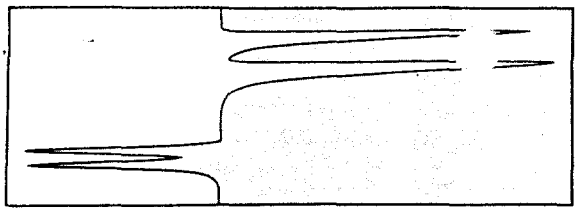
Separation Pressure: 52 psig

Total Flowrate: 210 KPH

Analyte	mg/kg
Sodium	9.62
Potassium	11.0
Calcium	1.44
Magnesium	0.37
Lithium	0.090
Strontium	0.030
Silica	143
Boron	7.75
Arsenic	0.080
Mercury	<0.00025
Cadmium	<0.00025
Beryllium	<0.00025
Lead	<0.0010
Iron	0.56
Manganese	0.056

Analyte	mg/kg
Chloride	3.10
Fluoride	0.269
Sulfate	29.4
Nitrate	<0.1
Bromide	<0.1
Total Alkalinity, as HCO_3^-	18.5
pH, units	7.62
Total Inorganic Carbon, as CO_2	<4
Ammonia	<0.2
Hydrogen Sulfide	8.77
Total Dissolved Solids	450
Total Suspended Solids	1400
Gross Alpha	9 ± 5 pCi/ℓ
Gross Beta	25 ± 4 pCi/ℓ
Total Asbestos	<19 MFL

Note: MFL=Million Fibers per Liter



THERMOCHEM

4965-01 (1-8) August 6, 1993

Report of Analysis

Report Type: KS-10 Clean-out Operation, PTO permit condition 20

Lab Number: 4965–03, 4951-1

Collection Date: 06-17-93

Well Name: KS-10

Collection Time: 18:00

Sample Point: Two-phase flow line, top port, sampling separator

Sample Type: Geothermal Steam

Wellhead Pressure: 1800 psig

Lip Pressure: 3.3 psig

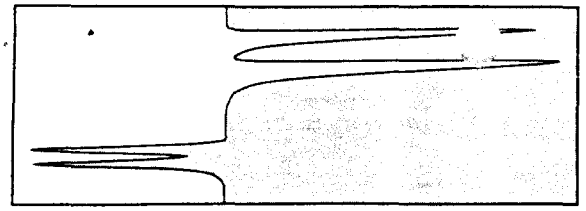
Separation Pressure: 46 psig

Total Flowrate: 177 KPH

Analyte	mg/kg
Silica	<0.050
Boron	<0.20
Arsenic	<0.0050
Mercury	<0.00026
Cadmium	<0.00025
Beryllium	<0.00025
Lead	<0.0010

Analyte	mg/kg
Chloride	<0.025
Fluoride	<0.025
Sulfate	<0.1
Nitrate	<0.1
Bromide	<0.1
pH, units	3.43
Total Dissolved Solids	<5.0
Total Suspended Solids	<1.0
Gross Alpha	0 ± 2 pCi/ℓ
Gross Beta	3 ± 3 pCi/ℓ
Total Asbestos	<0.2 MFL

Note: MFL=Million Fibers per Liter



THERMOCHEM

4965-01 (1-8) August 6, 1993

Report of Analysis

Report Type: KS-10 Clean-out Operation, PTO permit condition 20

Lab Number: 4965–05, 4951-4

Collection Date: 06-19-93

Well Name: KS-10

Collection Time: 10:25

Sample Point: Two-phase production line, bottom port, sampling separator

Sample Type: Geothermal Steam

Wellhead Pressure: 1690 psig

Separation Pressure: 250 psig

Analyte	mg/kg	Analyte	mg/kg
Silica	<0.050	Chloride	<0.025
Boron	<0.20	Fluoride	0.033
Arsenic	<0.0050	Sulfate	<0.1
Mercury	<0.00025	Nitrate	<0.1
Cadmium	<0.00025	Bromide	<0.1
Beryllium	<0.00025	pH, units	3.19
Lead	<0.0010	Total Dissolved Solids	<5.0
		Total Suspended Solids	<1.0
		Gross Alpha	0 ± 3 pCi/ℓ
		Gross Beta	162 ± 8 pCi/ℓ
		Total Asbestos	<0.2 MFL

Note: MFL=Million Fibers per Liter

PUNA GEOTHERMAL VENTURE
A Hawaii Partnership

July 12, 1993

John C. Lewin, M.D., Director
State Department of Health
P.O. Box 3378
Honolulu, HI 96801

SUBJ: KS-10 STEAM SAMPLE ANALYSIS

Dear Dr. Lewin,

Attached please find the Report of Analysis for steam samples taken from Well KS-10 on June 17 and June 19 of this year.

Should you or your staff have any questions, please contact me.

Sincerely,

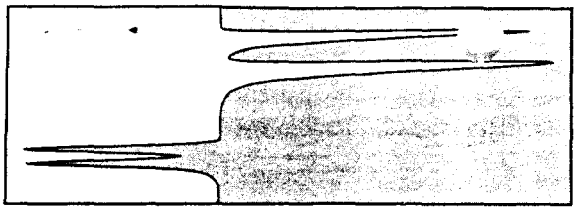
Thomas G. Kizis

Thomas G. Kizis
Environmental Manager

c: S. Morris
D. Berube
N. Hirai (DOH)
G. Davidson
Mesquite

File: KS-10

14-3860 Kapoho-Pahoa Road, Pahoa, Hawaii 96778 • (808) 961-2786 • Facsimile (808) 935-5562
Post Office Box 30, Pahoa, Hawaii 96778



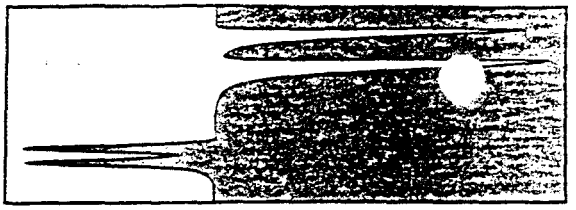
THERMOCHEM

4964 (1-6) July 6, 1993

Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Report of Analysis

Lab Number	Descriptor	Chloride ppm_w	Sodium ppm_w
4964-1	KS-10 Steam 06-17-93 18:00 LP=46 psig LIP=3.3 psig	<0.025	0.087
4964-2	KS-10 06-17-93 18:00 LP=46 psig LIP=3.3 psig	<0.025	0.091
4964-3	KS-10 Steam 06-19-93 10:25 Sep=250 psig, Temp=607°F, WHP=1690 psig	<0.025	0.0090
4964-4	KS-10 Steam 06-19-93 10:25 Sep=250 psig, WHT=607°F, WHP=1690 psig	<0.025	0.012
4964-5	KS-10 Steam 06-19-93 10:25 Sep=250 psig, WHT=607°F, WHP=1690 psig	<0.025	0.0080
4964-6	PGV Steam Header 06-19-93 11:56 LP=260 psig, LT=404°F	<0.025	<0.0050



THERMOCHEM

4950 (1-11) July 7, 1993

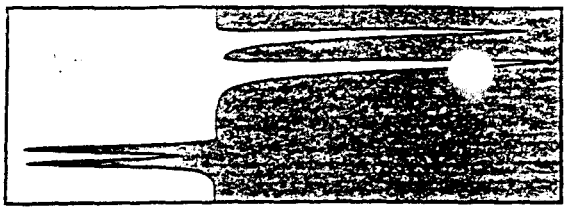
Descriptor: KS-10 6-19-1993 10:05
SAMPLING SEPARATOR, 2-PHASE LINE, 250 PSIG
WHT = 607 deg F WHP = 1700 PSIG

Lab Number: 4950-06

Sample Gas/Steam Ratio (ft^3/lb):	0.0131
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	655
Sample Gas/Steam Ratio (ppm by weight):	1120
Percent Air in Sample:	0.486
STP Mls Air in Sample:	2.90
Total Weight of Condensate (grams):	731
Initial Headspace Pressure (psi):	3.28

Gas	Dry Gas % by Volume	Moles per 10^6 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	1.38 E +01	9.03 E +01	2.20 E +02
Hydrogen Sulfide	7.02 E +01	4.60 E +02	8.68 E +02
Ammonia	<3.97 E -02	<2.60 E -01	<2.46 E -01
Argon	3.15 E -02	2.06 E -01	4.57 E -01
Nitrogen	1.56 E +00	1.02 E +01	1.59 E +01
Methane	<3.91 E -02	<2.56 E -01	<2.28 E -01
Hydrogen	1.45 E +01	9.48 E +01	1.06 E +01

Radon (Pico Curies/Liter Dry Gas, STP):	3260
Radon (Pico Curies/Kg Steam):	2653



THERMOCHEM

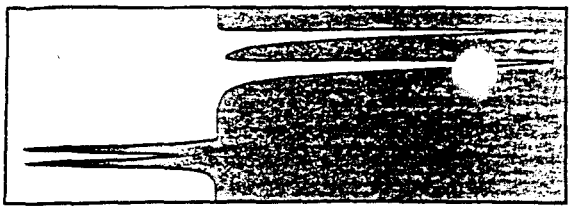
Descriptor: KS-10 6-19-1993 10:07
SAMPLING SEPARATOR, 2-PHASE LINE, 250 PSIG
WHT = 607 deg F WHP = 1700 PSIG

Lab Number: 4950-07

Sample Gas/Steam Ratio (ft^3/lb):	0.0133
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	669
Sample Gas/Steam Ratio (ppm by weight):	1140
Percent Air in Sample:	0.743
STP Mls Air in Sample:	3.07
Total Weight of Condensate (grams):	493
Initial Headspace Pressure (psi):	3.74

Gas	Dry Gas % by Volume	Moles per 10^6 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	1.44 E +01	9.66 E +01	2.36 E +02
Hydrogen Sulfide	6.97 E +01	4.67 E +02	8.81 E +02
Ammonia	<4.22 E -02	<2.82 E -01	<2.66 E -01
Argon	2.97 E -02	1.98 E -01	4.40 E -01
Nitrogen	1.46 E +00	9.78 E +00	1.52 E +01
Methane	<3.61 E -02	<2.41 E -01	<2.15 E -01
Hydrogen	1.43 E +01	9.58 E +01	1.07 E +01

Radon (Pico Curies/Liter Dry Gas, STP):	3251
Radon (Pico Curies/Kg Steam):	2702



THERMOCHEM

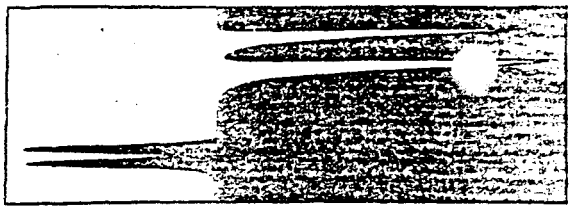
Descriptor: KS-10 6-17-1993 18:50
LP = 60-65 PSIG LIP = 6.8-9.0

Lab Number: 4950-04

Sample Gas/Steam Ratio (ft^3/lb):	0.0138
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	693
Sample Gas/Steam Ratio (ppm by weight):	1200
Percent Air in Sample:	0.669
STP Mls Air in Sample:	2.47
Total Weight of Condensate (grams):	426
Initial Headspace Pressure (psi):	2.51

Gas	Dry Gas % by Volume	Moles per 10^6 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	1.51 E +01	1.05 E +02	2.55 E +02
Hydrogen Sulfide	6.99 E +01	4.84 E +02	9.15 E +02
Ammonia	<4.21 E -02	<2.91 E -01	<2.75 E -01
Argon	2.94 E -02	2.03 E -01	4.51 E -01
Nitrogen	1.52 E +00	1.05 E +01	1.63 E +01
Methane	<4.85 E -02	<3.36 E -01	<2.98 E -01
Hydrogen	1.34 E +01	9.31 E +01	1.04 E +01

Radon (Pico Curies/Liter Dry Gas, STP):	3175
Radon (Pico Curies/Kg Steam):	2733



THERMOCHEM

4950 (1-11) July 7, 1993

Quality Control Data

Samples Received: June 22, 1993

Requested by: Greg Davidson
Puna Geothermal Venture
P.O. Box 30
Pahoa, HI 96778

Analyte	Precision (% RSD)	External Standard (% Recovery)	Sample Spike (% Recovery)
Carbon Dioxide	6.8, 0.8	103, 97	96
Hydrogen Sulfide	0.97, 0.39	99, 101	101
Ammonia	N/A	99, 99	105
Nitrogen	5.3, 1.6, 5.2	100	N/A
Methane	N/A	96	N/A
Hydrogen	3.4, 0.7, 0.9	92	N/A

Precision: Percent Relative Standard Deviation of replicate sample analyses.

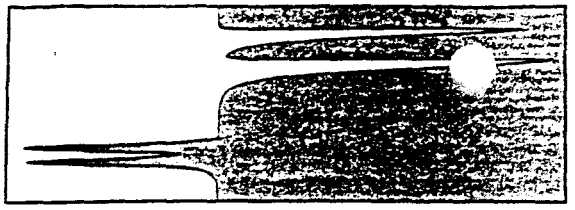
External Standard: Percent Recovery of an independent audit standard analyzed against calibration standards (measured/known x 100).

Sample Spike: Percent Recovery of a known quantity of standard added to sample (measured/theoretical x 100).

N/A: Not applicable.

Paul N. Hirtz
Director of Operations

Distribution: Greg Davidson
Tom Kizis



THERMOCHEM

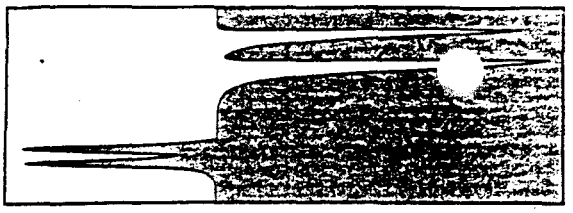
Descriptor: KS-10 6-17-1993 17:40
LP = 48 PSIG LIP = 4 PSIG

Lab Number: 4950-01

Sample Gas/Steam Ratio (ft^3/lb):	0.0133
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	670
Sample Gas/Steam Ratio (ppm by weight):	1160
Percent Air in Sample:	0.316
STP Mls Air in Sample:	2.27
Total Weight of Condensate (grams):	859
Initial Headspace Pressure (psi):	4.68

Gas	Dry Gas % by Volume	Moles per 10^3 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	1.51 E +01	1.01 E +02	2.47 E +02
Hydrogen Sulfide	6.98 E +01	4.68 E +02	8.84 E +02
Ammonia	8.35 E -02	5.59 E -01	5.28 E -01
Argon	3.05 E -02	2.05 E -01	4.53 E -01
Nitrogen	1.72 E +00	1.15 E +01	1.79 E +01
Methane	3.01 E -02	2.02 E -01	1.79 E -01
Hydrogen	1.32 E +01	8.83 E +01	9.88 E +00

Radon (Pico Curies/Liter Dry Gas, STP):	3050
Radon (Pico Curies/Kg Steam):	2539



THERMOCHEM

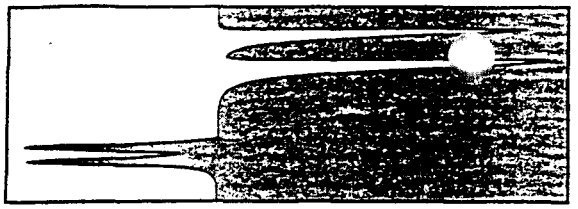
Descriptor: KS-10 6-17-1993 17:50
LP = 47 PSIG LIP = 3.5 PSIG

Lab Number: 4950-02

Sample Gas/Steam Ratio (ft^3/lb):	0.0136
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	683
Sample Gas/Steam Ratio (ppm by weight):	1180
Percent Air in Sample:	0.457
STP Mls Air in Sample:	2.91
Total Weight of Condensate (grams):	746
Initial Headspace Pressure (psi):	3.67

Gas	Dry Gas % by Volume	Moles per 10^3 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	1.51 E +01	1.03 E +02	2.52 E +02
Hydrogen Sulfide	6.97 E +01	4.76 E +02	8.99 E +02
Ammonia	4.95 E -02	3.38 E -01	3.19 E -01
Argon	3.02 E -02	2.06 E -01	4.56 E -01
Nitrogen	1.56 E +00	1.07 E +01	1.66 E +01
Methane	<3.24 E -02	<2.21 E -01	<1.97 E -01
Hydrogen	1.35 E +01	9.25 E +01	1.04 E +01

Radon (Pico Curies/Liter Dry Gas, STP):	3369
Radon (Pico Curies/Kg Steam):	2858



THERMOCHEM

4950 (1-11) July 7, 1993

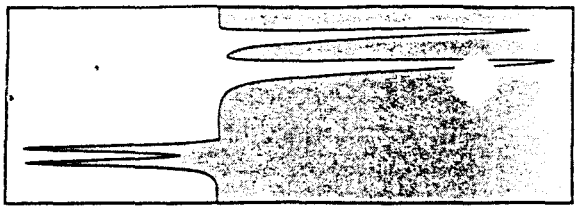
Descriptor: KS-10 6-17-1993 18:45
LP = 60 PSIG LIP = 6.8 PSIG

Lab Number: 4950-03

Sample Gas/Steam Ratio (ft^3/lb):	0.0137
Sample Gas/Steam Ratio (moles per 10^6 moles H_2O):	688
Sample Gas/Steam Ratio (ppm by weight):	1190
Percent Air in Sample:	0.367
STP Mls Air in Sample:	1.50
Total Weight of Condensate (grams):	476
Initial Headspace Pressure (psi):	3.28

Gas	Dry Gas % by Volume	Moles per 10^3 Moles H_2O	PPM By Weight
Water Vapor	N/A	N/A	9.99 E +05
Carbon Dioxide	1.45 E +01	9.96 E +01	2.43 E +02
Hydrogen Sulfide	7.06 E +01	4.86 E +02	9.18 E +02
Ammonia	<4.14 E -02	<2.85 E -01	<2.69 E -01
Argon	2.85 E -02	1.97 E -01	4.35 E -01
Nitrogen	1.49 E +00	1.03 E +01	1.60 E +01
Methane	<3.75 E -02	<2.58 E -01	<2.30 E -01
Hydrogen	1.34 E +01	9.21 E +01	1.03 E +01

Radon (Pico Curies/Liter Dry Gas, STP):	3371
Radon (Pico Curies/Kg Steam):	2883



THERMOCHEM

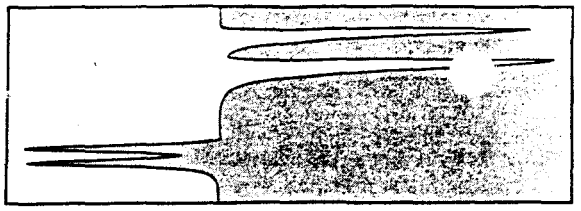
Descriptor: KS-10 06-17-1993 17:45
LP = 48 PSIG LIP = 4 PSIG

Lab Number: 4947-01

Comprehensive Hydrocarbon Scan

Gas	Moles per 10^6 Moles H_2O	PPM By Weight
Methane	2.16 E -01	1.92 E -01
Ethylene	4.35 E -03	6.77 E -03
Ethane	1.47 E -02	2.45 E -02
Propylene	3.54 E -03	8.27 E -03
Propane	6.46 E -03	1.58 E -02
Isobutane	2.28 E -03	7.36 E -03
1-Butene	1.77 E -03	5.52 E -03
Butane	2.29 E -03	7.39 E -03
2,2-Dimethylpropane	<3.43 E -05	<1.37 E -04
2-Methylbutane	7.10 E -04	2.84 E -03
1-Pentene	1.90 E -04	7.38 E -04
Pentane	1.18 E -03	4.72 E -03
2,2-Dimethylbutane	<2.53 E -05	<1.21 E -04
(2 and 3)-Methylpentane	8.65 E -05	4.13 E -04
Hexene	6.08 E -05	2.84 E -04
Hexane	6.97 E -04	3.33 E -03
Benzene	6.04 E -03	2.62 E -02
Toluene	6.57 E -03	3.36 E -02
Ethyl Benzene	1.69 E -03	9.97 E -03
1,3 & 1,4-Xylene	5.46 E -03	3.22 E -02
1,2-Xylene	1.38 E -03	8.12 E -03
Additional Hydrocarbons*	5.33 E -03	4.74 E -03

*Additional hydrocarbons in the weight range C_2 through C_6 are quantitated as methane.



THERMOCHEM

4947 (1-7) June 24, 1993

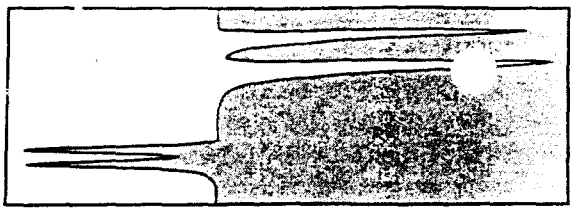
Descriptor: KS-10 06-17-1993 17:55
LP = 48 PSIG LIP = 3.5 PSIG

Lab Number: 4947-02

Comprehensive Hydrocarbon Scan

Gas	Moles per 10^6 Moles H_2O	PPM By Weight
Methane	2.23 E -01	1.98 E -01
Ethylene	2.84 E -03	4.42 E -03
Ethane	1.53 E -02	2.55 E -02
Propylene	2.21 E -03	5.17 E -03
Propane	6.75 E -03	1.65 E -02
Isobutane	2.49 E -03	8.03 E -03
1-Butene	5.81 E -04	1.81 E -03
Butane	2.41 E -03	7.79 E -03
2,2-Dimethylpropane	<3.41 E -05	<1.36 E -04
2-Methylbutane	9.29 E -04	3.72 E -03
1-Pentene	1.02 E -04	3.98 E -04
Pentane	1.26 E -03	5.03 E -03
2,2-Dimethylbutane	<2.47 E -05	<1.18 E -04
(2 and 3)-Methylpentane	7.82 E -05	3.74 E -04
Hexene	3.27 E -05	1.53 E -04
Hexane	6.58 E -04	3.15 E -03
Benzene	5.95 E -03	2.58 E -02
Toluene	6.69 E -03	3.42 E -02
Ethyl Benzene	1.54 E -03	9.09 E -03
1,3 & 1,4-Xylene	5.08 E -03	2.99 E -02
1,2-Xylene	1.30 E -03	7.67 E -03
Additional Hydrocarbons*	2.90 E -03	2.59 E -03

*Additional hydrocarbons in the weight range C_2 through C_6 are quantitated as methane.



THERMOCHEM

4947 (1-7) June 24, 1993

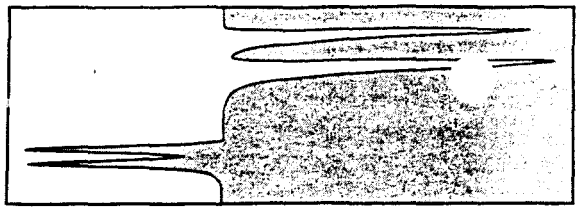
Descriptor: KS-10 06-17-1993 18:45
LP=48 PSIG LIP=6.8 PSIG

Lab Number: 4947-03

Comprehensive Hydrocarbon Scan

Gas	Moles per 10^6 Moles H_2O	PPM By Weight
Methane	2.01 E -01	1.78 E -01
Ethylene	2.99 E -03	4.65 E -03
Ethane	1.27 E -02	2.11 E -02
Propylene	2.06 E -03	4.81 E -03
Propane	5.58 E -03	1.37 E -02
Isobutane	1.97 E -03	6.36 E -03
1-Butene	8.44 E -04	2.63 E -03
Butane	1.93 E -03	6.22 E -03
2,2-Dimethylpropane	<5.03 E -05	<2.01 E -04
2-Methylbutane	6.87 E -04	2.75 E -03
1-Pentene	1.67 E -04	6.50 E -04
Pentane	9.56 E -04	3.83 E -03
2,2-Dimethylbutane	<3.73 E -05	<1.78 E -04
(2 and 3)-Methylpentane	7.64 E -05	3.66 E -04
Hexene	4.00 E -05	1.87 E -04
Hexane	6.06 E -04	2.90 E -03
Benzene	4.82 E -03	2.09 E -02
Toluene	5.05 E -03	2.58 E -02
Ethyl Benzene	7.50 E -04	4.42 E -03
1,3 & 1,4-Xylene	3.14 E -03	1.85 E -02
1,2-Xylene	7.97 E -04	4.70 E -03
Additional Hydrocarbons*	3.75 E -03	3.34 E -03

*Additional hydrocarbons in the weight range C_2 through C_6 are quantitated as methane.



THERMOCHEM

4947 (1-7) June 24, 1993

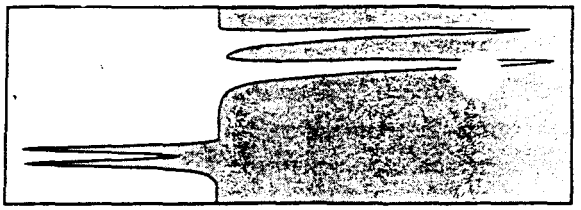
Descriptor: KS-10 06-17-1993 18:50
LP=60 PSIG LIP=6.8 PSIG

Lab Number: 4947-04

Comprehensive Hydrocarbon Scan

Gas	Moles per 10^6 Moles H_2O	PPM By Weight
Methane	2.04 E -01	1.82 E -01
Ethylene	2.47 E -03	3.85 E -03
Ethane	1.28 E -02	2.14 E -02
Propylene	1.80 E -03	4.19 E -03
Propane	5.69 E -03	1.39 E -02
Isobutane	2.05 E -03	6.60 E -03
1-Butene	7.41 E -04	2.31 E -03
Butane	1.99 E -03	6.41 E -03
2,2-Dimethylpropane	<4.58 E -05	<1.83 E -04
2-Methylbutane	6.03 E -04	2.41 E -03
1-Pentene	1.07 E -04	4.15 E -04
Pentane	9.14 E -04	3.66 E -03
2,2-Dimethylbutane	<3.39 E -05	<1.62 E -04
(2 and 3)-Methylpentane	7.48 E -05	3.58 E -04
Hexene	3.45 E -05	1.61 E -04
Hexane	5.81 E -04	2.78 E -03
Benzene	5.03 E -03	2.18 E -02
Toluene	5.56 E -03	2.84 E -02
Ethyl Benzene	7.71 E -04	4.54 E -03
1,3 & 1,4-Xylene	3.46 E -03	2.04 E -02
1,2-Xylene	9.17 E -04	5.40 E -03
Additional Hydrocarbons*	4.13 E -03	3.67 E -03

*Additional hydrocarbons in the weight range C_2 through C_6 are quantitated as methane.



THERMOCHEM

4947 (1-7) June 24, 1993

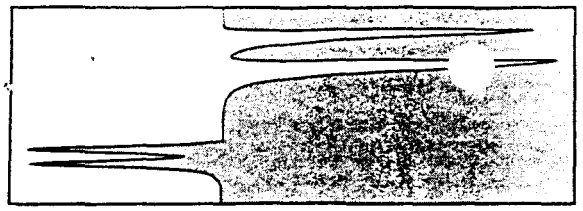
Descriptor: KS-10 06-19-1993 10:15
SAMPLING SEPARATOR, 2-PHASE LINE, 250 PSIG
WHT = 607 deg F, WHP = 1700 PSIG

Lab Number: 4947-05

Comprehensive Hydrocarbon Scan

Gas	Moles per 10^3 Moles H_2O	PPM By Weight
Methane	1.77 E -01	1.58 E -01
Ethylene	3.88 E -04	6.04 E -04
Ethane	1.09 E -02	1.83 E -02
Propylene	3.83 E -04	8.94 E -04
Propane	5.39 E -03	1.32 E -02
Isobutane	1.84 E -03	5.92 E -03
1-Butene	1.78 E -04	5.55 E -04
Butane	1.81 E -03	5.84 E -03
2,2-Dimethylpropane	<3.98 E -05	<1.59 E -04
2-Methylbutane	5.74 E -04	2.30 E -03
1-Pentene	4.80 E -05	1.87 E -04
Pentane	7.67 E -04	3.07 E -03
2,2-Dimethylbutane	<2.94 E -05	<1.41 E -04
(2 and 3)-Methylpentane	1.05 E -04	5.03 E -04
Hexene	2.44 E -05	1.14 E -04
Hexane	4.73 E -04	2.26 E -03
Benzene	4.87 E -03	2.11 E -02
Toluene	5.13 E -03	2.62 E -02
Ethyl Benzene	7.44 E -04	4.38 E -03
1,3 & 1,4-Xylene	3.05 E -03	1.80 E -02
1,2-Xylene	8.08 E -04	4.76 E -03
Additional Hydrocarbons*	2.70 E -03	2.40 E -03

*Additional hydrocarbons in the weight range C_2 through C_6 are quantitated as methane.



THERMOCHEM

4947 (1-7) June 24, 1993

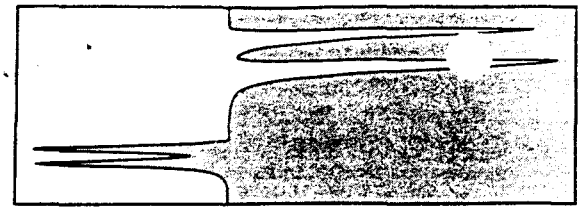
Descriptor: KS-10 06-19-1993 10:19
SAMPLING SEPARATOR, 2-PHASE LINE, 250 PSIG
WHT = 607 deg F, WHP = 1700 PSIG

Lab Number: 4947-06

Comprehensive Hydrocarbon Scan

Gas	Moles per 10^6 Moles H_2O	PPM By Weight
Methane	1.86 E -01	1.66 E -01
Ethylene	3.65 E -04	5.68 E -04
Ethane	1.13 E -02	1.89 E -02
Propylene	3.74 E -04	8.73 E -04
Propane	6.18 E -03	1.51 E -02
Isobutane	1.89 E -03	6.09 E -03
1-Butene	1.76 E -04	5.47 E -04
Butane	1.90 E -03	6.14 E -03
2,2-Dimethylpropane	<3.99 E -05	<1.60 E -04
2-Methylbutane	6.33 E -04	2.53 E -03
1-Pentene	5.21 E -05	2.03 E -04
Pentane	8.15 E -04	3.26 E -03
2,2-Dimethylbutane	<2.95 E -05	<1.41 E -04
(2 and 3)-Methylpentane	9.52 E -05	4.55 E -04
Hexene	2.43 E -05	1.14 E -04
Hexane	4.94 E -04	2.36 E -03
Benzene	4.66 E -03	2.02 E -02
Toluene	4.57 E -03	2.34 E -02
Ethyl Benzene	4.80 E -04	2.83 E -03
1,3 & 1,4-Xylene	2.22 E -03	1.31 E -02
1,2-Xylene	5.92 E -04	3.49 E -03
Additional Hydrocarbons*	2.94 E -03	2.62 E -03

*Additional hydrocarbons in the weight range C_2 through C_8 are quantitated as methane.



THERMOCHEM

4947 (1-7) June 24, 1993

Descriptor: PGV STEAM HEADER 06-19-1993 11:45
LP=260 PSIG LT=404 deg F

Lab Number: 4947-07

Comprehensive Hydrocarbon Scan

Gas	Moles per 10^6 Moles H_2O	PPM By Weight
Methane	1.96 E -01	1.74 E -01
Ethylene	3.90 E -04	6.07 E -04
Ethane	1.35 E -02	2.25 E -02
Propylene	2.81 E -04	6.56 E -04
Propane	5.92 E -03	1.45 E -02
Isobutane	2.20 E -03	7.11 E -03
1-Butene	1.70 E -04	5.30 E -04
Butane	2.24 E -03	7.21 E -03
2,2-Dimethylpropane	<4.35 E -05	<1.74 E -04
2-Methylbutane	5.55 E -04	2.22 E -03
1-Pentene	4.21 E -05	1.64 E -04
Pentane	8.30 E -04	3.32 E -03
2,2-Dimethylbutane	<3.22 E -05	<1.54 E -04
(2 and 3)-Methylpentane	<3.14 E -05	<1.50 E -04
Hexene	2.72 E -05	1.27 E -04
Hexane	4.17 E -04	1.99 E -03
Benzene	5.82 E -03	2.52 E -02
Toluene	6.04 E -03	3.09 E -02
Ethyl Benzene	7.94 E -04	4.68 E -03
1,3 & 1,4-Xylene	3.39 E -03	2.00 E -02
1,2-Xylene	1.09 E -03	6.43 E -03
Additional Hydrocarbons*	1.72 E -03	1.53 E -03

*Additional hydrocarbons in the weight range C_2 through C_6 are quantitated as methane.